Final Environmental Assessment/ Overseas Environmental Assessment

East Coast Testing of the Tomahawk Land Attack Missile

December 2004

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This environmental assessment/overseas environmental assessment identifies and evaluates the potential effects of continued testing of the Tomahawk land attack missile (TLAM) on the East Coast of the United States. The Proposed Action only differs from existing conditions in that a new TLAM variant would be tested and that three additional target areas would be used. The additional target areas are established ranges whose current military operations are similar to the proposed TLAM testing. No significant impacts are anticipated as a result of the Proposed Action.

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FINDING OF NO SIGNIFICANT IMPACT

FOR

East Coast Testing of the Tomahawk Land Attack Missile
Eglin AFB FL

RCS 03-849

Introduction

This finding and the analysis upon which it is based were prepared pursuant to the National Environmental Policy Act (NEPA) and its implementing regulations as promulgated at 40 Code of Federal Regulations (CFR) Part 1500 (40 CFR §§1500-1508) plus:

- US Navy guidelines as prescribed in Chief of Naval Operations Instruction 5090.1B
- US Air Force *Environmental Impact Analysis Process* as promulgated at 32 CFR §§989, and
- Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions* (32 CFR §§187)

The Department of the Navy, as the lead agency, with the Department of the Air Force as a cooperating agency, has prepared an Environmental Assessment/Overseas Environmental Assessment (EA/OEA) of the potential environmental impacts associated with the Navy's proposed *East Coast Testing of the Tomahawk Land Attack Missile* (TLAM) at Eglin Air Force Base, Florida. That December 2004 EA/OEA is hereby incorporated by reference into this finding.

Purpose and Need

The purpose of the Proposed Action is to support the Navy's Tomahawk weapon system by conducting flight tests of TLAM variants and, at the same time, training personnel of the Second Fleet in the operational use of the TLAM. The Second Fleet is based in Norfolk, Virginia, and has been conducting TLAM flight tests at established testing and training facilities on the east and gulf coasts of the U.S. for many years. Continued east coast flight testing is needed to maintain combat readiness, provide training opportunities for the Second Fleet, evaluate missile improvements and improve computer simulation capabilities.

Current Situation

The Second Fleet currently conducts 6 to 12 TLAM test/training flights annually using 3 TLAM variants: submunitions (TLAM-D), unitary or 1,000-lb conventional ordnance (TLAM-C), and nuclear (TLAM-N). All TLAMS are equipped with inert materials called payloads that mimic the weight of a conventional warhead. Once the flight is completed, the missiles are then recovered by a parachute recovery module (this is the case for C and N variants) or a range safety system (this is the case for D variants). To date, the Second Fleet has tested the C and N variants predominately off the east and gulf coasts of the U.S. The TLAM-D which is mainly tested off the west coast of the U.S., has been tested only once off the Gulf of Mexico after the Navy received a special one-time waiver.

Test missiles are launched from ships or submarines within designated military operations areas, either in the Eglin Gulf Test Range or in the Atlantic Ocean off the east coast of Florida. Test missiles, accompanied by primary and secondary chase aircraft and a communications relay aircraft, follow established military training routes through special use airspace to targets within Eglin's B-70 range. Flight route restrictions have been established to avoid population centers and industrial areas. Should an in-flight anomaly develop, a flight safety officer in the chase aircraft can override the missile flight control system and redirect the missile to a prearranged emergency termination area. A team of recovery and emergency response personnel are on standby during every TLAM test.

Description of Proposed Action and Alternatives

Proposed Action

Under the Proposed Action one new TLAM variant and three more Eglin test areas would be added to the current east coast TLAM test/training program. The new Tactical Tomahawk variant (TLAM-E) is an updated, slightly smaller version of TLAM-C. The biggest change to the TLAM-E is the use of a range safety system to recover the missile instead of a parachute recovery module. As before, all test missiles would carry inert payloads in place of warheads. The TLAMs would continue to be launched from the entire launch areas currently used, at approximately the same frequency (between 6 and 12 TLAM flight tests per year), and would continue to use the same military training routes to reach Eglin AFB. Targets at three additional Eglin test areas—B-75, C-52, and C-72—would be used in addition to the targets currently used in test area B-70.

No-Action Alternative

The No-Action Alternative would be to continue the current east coast TLAM test/training program without change. Targets would be confined to Eglin test area B-70. New variants, such as the TLAM-E, would not be tested. However, the No-Action Alternative would severely undermine the Navy's ability to maintain the mission effectiveness of the Tomahawk weapon system.

Facilities Considered But Eliminated From Detailed Analysis

The Navy considered incorporating the following Atlantic Coast facilities into the TLAM east coast test/training program; however, all were eliminated from further consideration because the available target areas and/or flight routes failed to meet program selection criteria: launches off the coasts of North Carolina and Virginia to targets at Marine Corps Air Station Cherry Point and/or Marine Corps Camp Lejeune; launches off the coast of Maine to targets at Navy SERE School grounds.

Environmental Impacts

The EA/OEA analyzed potential adverse impacts of the Proposed Action on land use, airspace, public health and safety, air quality, noise levels, biological resources, cultural resources and water resources. In addition, social justice issues involving potentially disproportionate impacts to minority and/or low-income communities and potential increased health and safety risks to children were examined. No significant adverse impacts were found in any of these areas. Nor is the Proposed Action expected to cause significant, cumulative impacts to any of these resources.

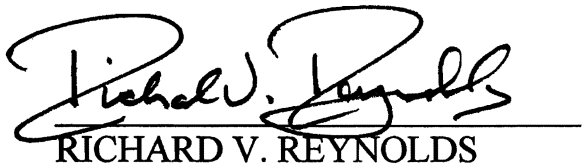
Both alternatives would create minor, unavoidable, adverse impacts involving noise from the TLAM and associated aircraft, and damage to soils and vegetation at missile impact areas. The noise impacts would be brief and soils and vegetation would be restored appropriately after TLAM impact. This short-term use of the environment would have inconsequential effects on the environment's long-term productivity, and there would be no additional commitments of irreversible or irretrievable resources.

Public Notice

A public notice was published in the Northwest Florida Daily News on 17 Oct 04 inviting the public to review and comment upon the EA. The public comment period closed on 31 Oct 04. No comments were received.

Finding of No Significant Impact

Based on my review of the EA/OEA, I conclude that Air Force support and participation in the Navy's Proposed Action would not have a significant adverse impact, either individually or cumulatively with other foreseeable actions, on the quality of the human or natural environment. This analysis fulfills the requirements of the National Environmental Policy Act, the Council on Environmental Quality's regulations, and the Air Force Environmental Impact Analysis Process, and an environmental impact statement is not required and will not be prepared.



RICHARD V. REYNOLDS
Lieutenant General, USAF
Vice Commander

3 Mar 05
Date

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U.S. Air Force
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Environmental Assessment/Overseas Environmental Assessment for East Coast Testing of the Tomahawk Land Attack Missile

Final

December 2004

Abstract

This environmental assessment/overseas environmental assessment identifies and evaluates the potential effects of continued testing of the Tomahawk land attack missile (TLAM) on the East Coast of the United States. The Proposed Action only differs from existing conditions in that a new TLAM variant would be tested and that three additional target areas would be used. The additional target areas are established ranges whose current military operations are similar to the proposed TLAM testing. No significant impacts are anticipated as a result of the Proposed Action.

Please contact the following person with comments and questions:

Mr. A. Keith Jenkins
Phone: 757-322-4616
Marine Resource Specialist
Naval Facilities Engineering Command, Atlantic
Natural Resources Branch
Attn: Code EV42KJ
6506 Hampton Blvd.
Norfolk, VA 23508-1278

EXECUTIVE SUMMARY

This environmental assessment/overseas environmental assessment (EA/OEA) addresses the potential environmental impacts associated with testing of the Tomahawk land attack missile (TLAM) on the East Coast of the United States.

This EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [USC] Sections 4321 *et seq.*); the Council on Environment Quality's (CEQ) implementing regulations (40 Code of Federal Regulations [CFR] Sections 1500-1508); Navy guidelines (Chief of Naval Operations Instruction [OPNAVINST] 5090.1B); and Air Force Instruction (AFI) 32-7061 (32 CFR Part 989). The Navy is the lead agency for the decision regarding the testing of TLAMs on the East Coast. Because the Navy would make use of Air Force test areas and targets, the Air Force has participated in the development of this EA/OEA as a cooperating agency.

This EA/OEA is also prepared in accordance with Executive Order (EO) 12114, *Environmental Effects Abroad of Major Federal Actions* (32 CFR 187, reprinted in 10 USC Section 131). In accordance with Naval Operations Instruction (OPNAVINST) 5090.1B, Appendix E, Chief of Naval Operations (CNO), *Environmental and Natural Resources Program Manual,* this EA/OEA provides an analysis of the likely environmental consequences of the Proposed Action.

S.1 Purpose and Need for the Proposed Action

The purpose of the Proposed Action is to support East Coast testing of the Tomahawk weapon system by conducting flight tests of current and future variants of the TLAM and, at the same time, training personnel of the Second Fleet in the operational use of the TLAM. Flight tests would consist of missile launches from surface ships and submarines; missile flights over water and land; and missile terminations at established land-based targets and test areas. Established testing and training facilities on the East and Gulf Coasts would be used for targets. Some of the proposed targets, within test areas at Eglin Air Force Base (AFB), Florida, are already being used in the TLAM Testing Program.

The Tomahawk weapon system is a critical asset to the Navy's combat capability. It provides the Navy with the ability to conduct precision, long-range strikes from surface ships and submarines against land targets. Continued East Coast flight testing is needed to maintain combat readiness, provide training opportunities for the Second Fleet, evaluate missile improvements, and improve computer simulation capabilities.

S.2 Description of the Proposed Action

The TLAM is a self-guided, terrain-following, subsonic cruise missile that is used as a low-altitude, land-attack weapon. The TLAM is designed to be launched from Navy ships and submarines against land targets. TLAMs currently tested on the East Coast carry inert material known as "payload" to mimic the weight and balance of a TLAM equipped with a conventional warhead.

A TLAM flight test can be divided into three phases: launch, cruise, and termination. The launch phase occurs over open ocean (within an Eglin Water Test Area [EWTA], a military warning area, or the contiguous US air defense identification zone [ADIZ]); the cruise phase occurs over open ocean and public and private lands; and the termination phase is always within a military range. The TLAM is most likely to experience failure in the launch phase and, to a lesser extent, the termination phase because of transitions in missile function that occur only during these two phases. Once the missile reaches cruise phase, functional changes do not occur, and failures are much less likely. Chase aircraft remain with the missile for the entire flight and are equipped with missile override and flight termination capabilities.

The proposed missile flight tests would involve only sea launches of missiles with inert warheads. A TLAM missile recovery plan has been developed specifically to define recovery safety criteria/procedures, equipment, and responsibilities for conducting recovery operations for all TLAM flight tests. Missile components jettisoned during the launch are not recovered.

The Proposed Action evaluated in this EA/OEA is the testing of current variants and one new variant of the TLAM. Unlike the current variant that can result in soft, parachute landings, the new variant would always result in a hard landing as it is not equipped with a parachute. Test missiles would continue to be equipped with inert warheads. TLAMs would continue to be launched from all of the launch areas currently used at approximately the same rate (between six and 12 TLAM flight tests per year). Targets at three additional test areas at Eglin AFB would be used, as would special-use airspace established for use of these facilities.

S.3 Alternatives to the Proposed Action

The Navy considered conducting test flights in North Carolina, launching the TLAM from warning areas off the coasts of North Carolina and Virginia, and terminating the flights either at BT-11 (controlled by Marine Corps Air Station [MCAS] Cherry Point) or the G-10 or G-12 impact areas at Marine Corps Base (MCB) Camp Lejeune. Both the MCAS Cherry Point and MCB Camp Lejeune target areas have been eliminated from further consideration because they do not meet mission requirements.

The Navy also considered conducting test flights off the coast of Maine, using launch areas within Warning Areas (W-) 102 and 103 (used by Griffiss AFB and Naval Air Station [NAS] Brunswick) and directing the missile to the Navy Survival, Escape, Rescue, and Evasion (SERE) School grounds in Remington. This consideration was based on the need for cold-weather TLAM testing, which the Navy no longer considers necessary. Further, the instrument flight routes (IRs) that supported this testing (IR-850/851/852) have lapsed. Lastly, the SERE School

grounds have never supported air-to-ground ordnance deliveries and, therefore, fail to meet an important target area criterion. Hence, this alternative was not given further consideration.

The No Action Alternative would be to continue testing of the TLAM at current levels (up to 12 flight tests a year), using the EWTAs and associated warning areas, the warning areas east of Jacksonville, Florida, the ADIZ near Miami, and the targets at Eglin AFB Test Area B-70. New variants, such as the TLAM-E, would not be tested. The No Action Alternative would severely undermine the Navy's ability to maintain the mission effectiveness of the Tomahawk weapon system through production missile testing, system upgrade testing, and training exercises. However, the No Action Alternative is fully analyzed in this EA/OEA, consistent with NEPA regulations.

S.4 Impacts of the Proposed Action

Because TLAMs are currently being tested (as described above in the No Action Alternative), only minor additional impacts would occur as a result of the Proposed Action. A new variant, TLAM-E, would be tested, which would increase the number of hard landings because TLAM-E does not have a parachute. However, few adverse effects are expected because the test ranges in the Proposed Action are already established for air-to-ground gunnery and munitions tests, including bombs, guided missiles, rockets, and submunitions.

The launch areas would be the same for the Proposed Action as they are for the No Action Alternative; therefore, they would not experience additional impacts. Impacts to land and surface uses, airspace, and coastal management in the additional three test areas would be the same as those under the current TLAM Program; such impacts would be insignificant. TLAM flight tests would be fully consistent with state and county enforceable policies of the Florida and Alabama Coastal Management Programs.

Like the No Action Alternative, only minor impacts on public health and safety, air quality, noise, and water resources would occur in areas not currently used for TLAM testing, namely the established Eglin AFB ranges at Test Areas B-75, C-52, and C-72. Such minor impacts would be insignificant because they would occur in existing IRs and existing ranges used for similar testing operations. Protected species and their habitats would not be affected by the Proposed Action.

Some test areas at Eglin AFB may contain identified cultural resources. Areas of Cultural Concern are located within Test Areas C-52 and C-72, but they would not be affected by the Proposed Action since these areas are currently used for similar testing operations and target areas would not be located in proximity to these resources. As cultural resources data are updated regularly, project managers should contact the Eglin AFB cultural resources staff before implementing the Proposed Action.

Finally, the Proposed Action would not have disproportionate impacts on minority or low-income populations, nor adverse health or safety impacts on populations of children. The Proposed Action would not cause significant, cumulative impacts to any resources. The only unavoidable, adverse impacts would be minor, temporary noise from the TLAM, aircraft, and

other test equipment and minor impacts on soils and vegetation during hard missile impacts. The noise impacts would be very brief, and soils and vegetation would be restored appropriately after hard landings. The Proposed Action would include short-term use of the environment and inconsequential long-term uses of the environment. There would be no additional commitment of irreversible and irretrievable resources.

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1 PURPOSE AND NEED

This environmental assessment/overseas environmental assessment (EA/OEA) addresses the potential environmental impacts associated with testing an additional variant (i.e. type) of the Tomahawk Land Attack Missile (TLAM) on the East Coast of the United States. Flight tests would consist of: missile launches from surface ships and submarines; missile flights over water and over land; and missile termination at established land-based targets and test areas. Only inert (non-explosive) warheads would be used for testing on the East Coast. Established testing and training facilities on the East and Gulf Coasts would be used for targets (Figure 1-1, Tomahawk Missile East Coast Test Facilities). Some of the proposed targets, which are within a test area at Eglin Air Force Base (AFB), Florida, are already being used in the TLAM Program. Additionally, this EA/OEA serves to consolidate several East Coast TLAM testing documents and to reanalyze potential impacts to the human environment in light of updated resource information.

The EA/OEA presents the purpose and need for the Proposed Action, identifies reasonable alternatives to the Proposed Action, describes the environment that would be affected by any of the reasonable alternatives, and analyzes the potential impacts to the environment from the Proposed Action and alternatives.

This EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [USC] Sections 4321 *et seq.*); the Council on Environment Quality's (CEQ) implementing regulations (40 Code of Federal Regulations [CFR] Sections 1500-1508); the Navy's NEPA implementing regulations (32 CFR Part 775); Navy guidelines (Chief of Naval Operations Instruction [OPNAVINST] 5090.1B); and Air Force Instruction (AFI) 32-7061 (32 CFR Part 989). The Navy is the lead agency for the decision regarding the testing of TLAMs on the East Coast. Because the Navy will make use of Air Force test areas and targets, the Air Force has participated in the development of this EA/OEA as a Cooperating Agency.

This EA/OEA is also prepared in accordance with Executive Order (EO) 12114, *Environmental Effects Abroad of Major Federal Actions* (32 CFR 187, reprinted in 10 USC Section 131). The provisions of EO 12114 apply to major federal actions that occur or have effects outside the territorial waters (i.e., more than 22 kilometers [km] or 12 nautical miles [nm] from shore) of the United States (US). The environment outside US territorial waters includes the Exclusive Economic Zone (EEZ), the global commons, and the environment of nonparticipating foreign nations. In accordance with OPNAVINST 5090.1B, Appendix E, Chief of Naval Operations (CNO), *Environmental and Natural Resources Program Manual,* this EA/OEA provides an analysis of the likely environmental consequences of the Proposed Action.

1.1 Background

The TLAM Program began in 1972. To date, the US military has launched about 1900 TLAMs against enemy forces. This is a key weapon system for the US Navy to project power ashore.

For the last twenty years, much of the testing and training on the East Coast of the US has taken place within and around Florida, utilizing Eglin AFB targets within test area B-70. Currently multiple East Coast documents exist that authorize the use of TLAM testing within Instrument Routes (IR) across Florida and Alabama. These documents are:

- IR 30/31 EA, completed with Finding of No Significant Impact (FONSI) signed April 1984.
- IR 15/32/33 EA, completed with FONSI signed July 1991.

In addition several Memoranda of Understanding (MOUs) between the TLAM Program Executive Officer (PEO) and the State of Florida have been signed authorizing the testing and training of TLAMs within Florida:

- 7 August 1995: Initial MOU between the State of Florida and the Program Executive Office;
- 28 August 1998: Amended to clarify pre-launch notification procedures; and
- 14 December 2000: Amended for PEO name change and one time launch extension for 15 Dec 2000.

1.2 Need for the Proposed Action

The need for the Proposed Action is to support The Operational Test Launch (OTL) program under which most of the TLAM test firings are conducted. The OTL was mandated in 1982 by the CNO to address the five objectives as stated:

1. Detect significant system performance degradation during a TLAM system life cycle.
2. Satisfy post-Initial Operating Capability requirements.
3. Provide realistic fleet unit and support activity training.
4. Develop diagnostic information that can lead to improved performance.
5. Determine adequacy of procedures for deployment.

The other need driving the Proposed Action is to train personnel of the Second Fleet in the operational use of the TLAM. The Second Fleet, one of the five numbered fleets in the US Navy, is based in Norfolk, Virginia, and is responsible for the Atlantic regions. Its mission is to deter conflict, to train Navy and Marine Corps personnel to respond to any type of emerging crisis, and, in the event of a general war, to carry out prompt and sustained combat. The TLAM is an essential tool in meeting that mission.

Tomahawk Missile East Coast Test Facilities

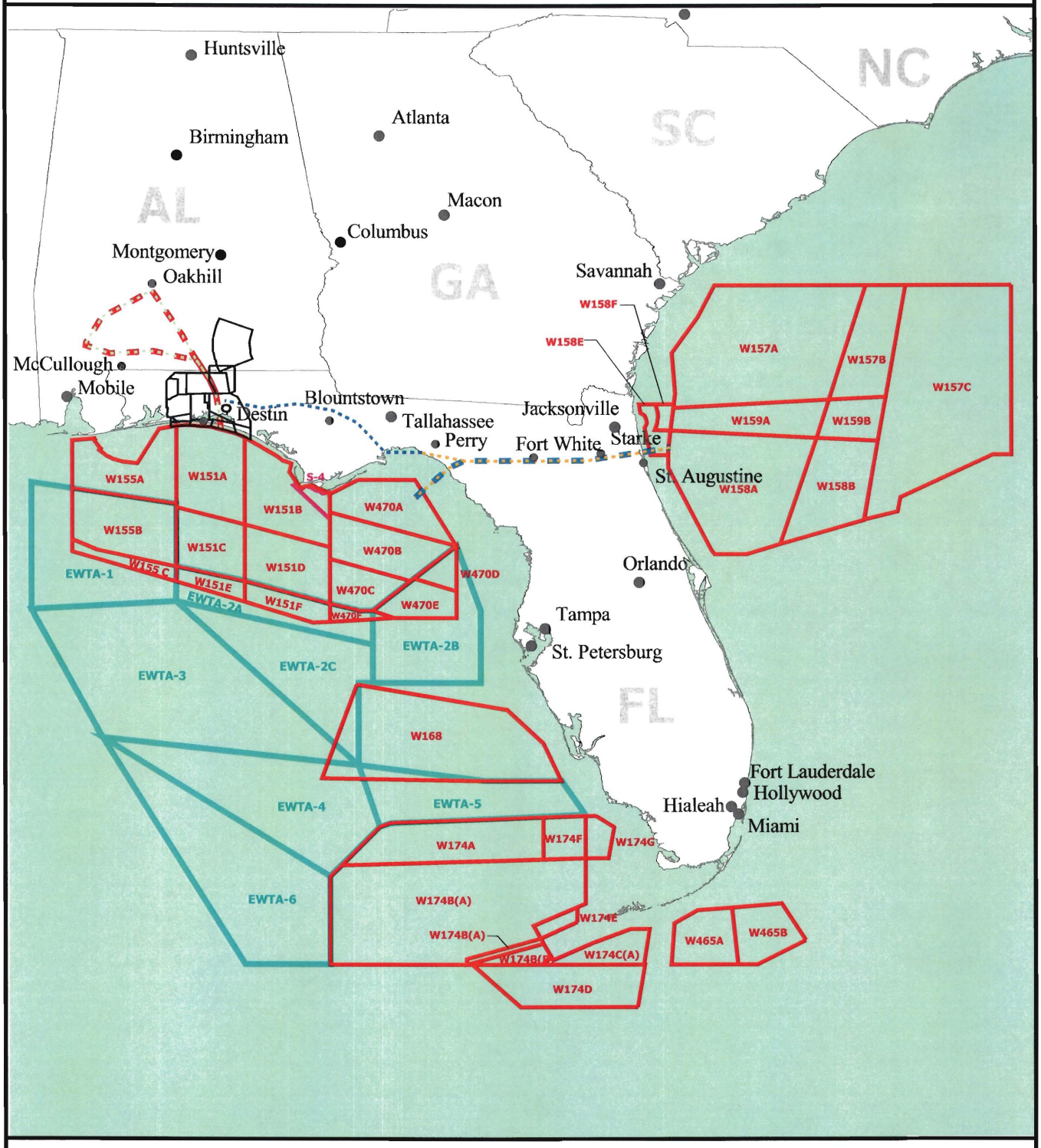


Figure 1-1

1.3 Purpose of the Proposed Action

The Tomahawk weapon system is a critical asset to the Navy's combat capability. It provides the Navy with the ability to conduct precision long-range strikes from surface ships and submarines against land targets. To maintain this capability, the Navy must continually improve the Tomahawk weapon system through research, development, testing, and evaluation. The Navy must also continually train personnel of the Fleets in the operation of the missile system. East Coast flight testing is needed for the following reasons:

- To maintain combat readiness. The Navy must conduct developmental and operational testing of inert missiles, and must evaluate and develop TLAM employment tactics and doctrine that depend on terrain and environment. The Navy can conduct both sub-surface and surface launches (submarines and ships) from the East Coast, and provide for long, overwater mission segments terminating at land targets in a variety of weather situations. East Coast testing can meet a variety of inert missile test and evaluation needs.

- To provide training opportunities for the Second Fleet. To provide personnel with training in the operational use of the missile, TLAM launches must be conducted in conjunction with Second Fleet training exercises. These flight tests are critical training opportunities for the Second Fleet.

- To evaluate missile improvements. The TLAM Program must conduct development tests to evaluate upgraded software and electronics systems.

- To improve computer simulation capabilities. The Tomahawk Test and Evaluation Program maintains and seeks to improve computer simulations of missile launches, flights, and target attacks. These highly accurate simulations are valuable tools for performing affordable analysis of the weapons system over a wide variety of conditions. However, the applicability of these simulations is limited by the data on which they are based. Flight tests are required to collect the data necessary for verifying, validating, and expanding the computer models.

The number of flight tests per year or the OTL program is a determination based on statistics and sample size in order to have statistically significant data to study. The minimum number of overall tests (not necessarily all of them on the East Coast) is eight.

1.4 Document Organization

Chapter 1, *Purpose and Need for the Proposed Action*: provides an overview of the reasons why the Navy needs to continue testing and evaluating current and enhanced TLAMs.

Chapter 2, *Description of Proposed Action and Alternatives*: introduces the TLAM and flight test procedures; states the mission requirements and protocols for launch and target areas; identifies East Coast facilities that meet these requirements and protocols; and combines launch, flight, and

target areas at East Coast facilities to develop flight test scenarios. The Proposed Action and the No Action Alternative are discussed.

Chapter 3, *Affected Environment*: describes the existing conditions for areas of environmental concern, namely: land use and airspace; public health and safety; air quality; noise; biological resources; cultural resources; and water resources.

Chapter 4, *Environmental Consequences*: evaluates the potential environmental impacts associated with each of the alternatives.

Chapter 5, *List of Preparers*: lists those individuals who assisted in the preparation of the EA/OEA and their qualifications.

Chapter 6, *List of Agencies and Persons Consulted:* contains a list of agencies and persons that have been consulted while developing this EA/OEA.

Chapter 7, *References*: contains a bibliography or references used or cited in the EA/OEA.

Chapter 8, *Acronyms and Abbreviations*: defines the acronyms used within the EA/OEA.

2 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This chapter provides an overview of the TLAM and TLAM flight test procedures, including the launch, cruise, and termination phases; sets forth TLAM mission requirements and testing protocols for sea launch sites and target areas; provides missile flight test scenarios; and describes the Proposed Action and the No Action Alternative.

2.1 Proposed Action

The Proposed Action includes testing a new variant, the Tactical Tomahawk, or TLAM-E, on the East Coast of the US and to expand the current testing scenarios. The Proposed Action would also include the continued testing of the current TLAM variants in the Atlantic and Gulf Coast special-use airspaces, IRs, and at Eglin AFB test areas that have typically been used in the past (B-70). Test flights would be conducted at the current rate of up to twelve flights a year.

The TLAM Program has not previously and would not test TLAM missiles with live warheads as part of the East Coast test venue(s). The testing scenarios involve inert-warheads only.

2.2 Introduction to the Tomahawk Missile and Flight Test

This subchapter provides an overview of the TLAM and TLAM flight procedures, including the launch, cruise, and termination phases. This subchapter also presents historical information on the reliability of the missile system.

2.2.1 The TLAM System

2.2.1.1 The Tomahawk Missile

The TLAM is a self-guided, terrain-following, subsonic cruise missile that is used as a low-altitude land-attack weapon. The TLAM is designed to be launched from Navy ships and submarines against land targets. Some basic attributes of the TLAM are shown in Figure 2-1 (The Tomahawk Land Attack Missile [TLAM]) and Table 2-1.

Table 2-1
TLAM Attributes

Feature		Measurement
Length (with booster engine)		20.5 feet (ft) (6.2 meters [m])
Diameter		20.4 inches (in) (51.8 centimeters [cm])
Weight	Start of Cruise	2,300 pounds (lbs) (1,043 kilograms [kg])
	End of Cruise (Booster released and fuel depleted)	1,500 lbs (680 kg)
Wing span		8.75 ft (2.67 m)
Cruise engine		606 lbs (275 kg)/m/s^2 thrust turbofan
Range		900 mi (1448 km)
Cruising speed		450 nm per hour (520 mph) (833 km/h)
Source: US Navy, 1988 in: Southwestern Division, NAVFACENGCOM, April 2000.		

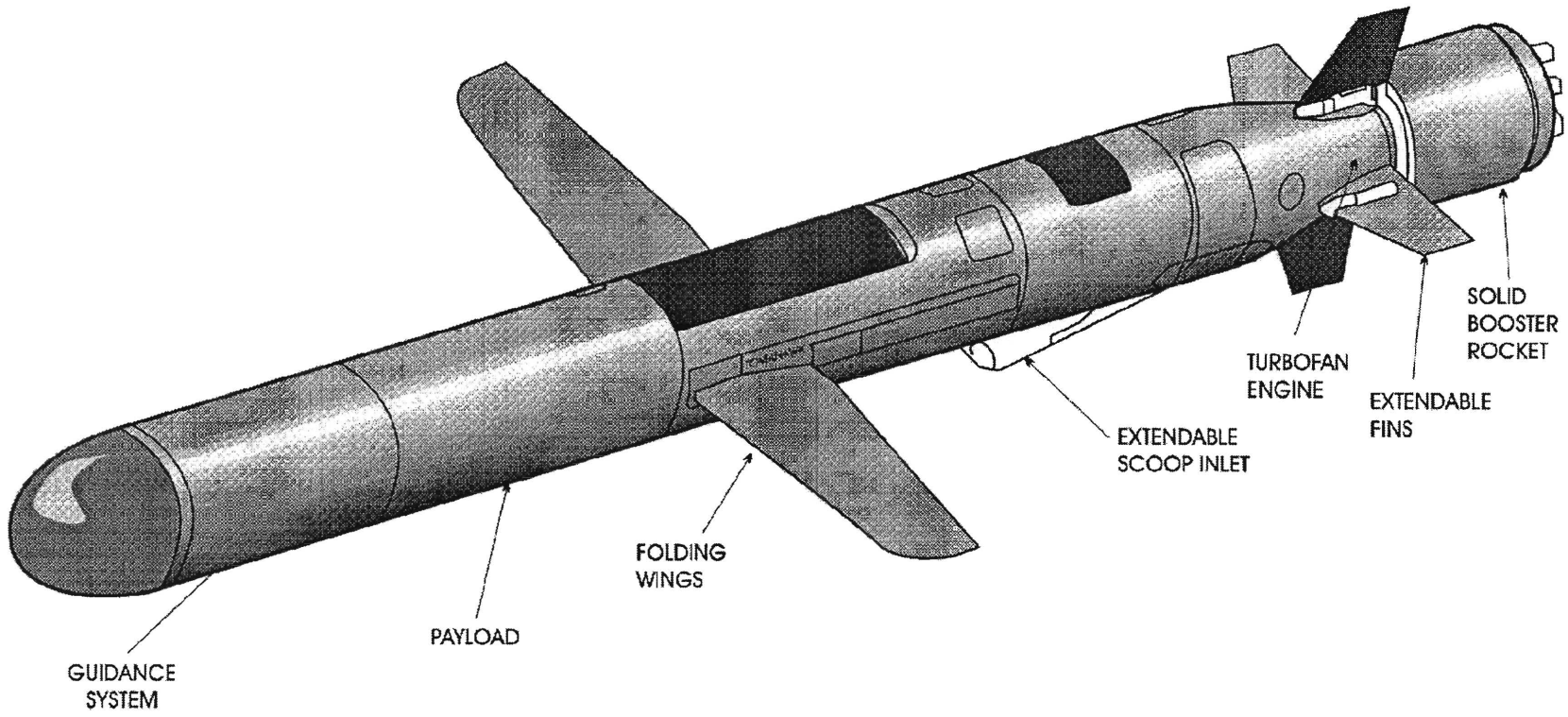
TLAMs currently tested on the East Coast carry inert material known as "payload" to mimic the weight and balance of a TLAM equipped with a conventional warhead. The material carried by each missile differs, depending on which combat variant is being tested. All TLAM-C and –N variants tested on the East Coast to date carry parachute recovery modules (REM). TLAM-Ds and TLAM-Es are equipped with a Range Safety System (RSS), and do not have an REM (parachute). Only one TLAM with an RSS (a TLAM-D) was tested on the East Coast, but it was launched by special waiver from the Gulf of Mexico into Eglin AFB and over-flew little public land. The current combat variants include:

- The submunitions variant (TLAM-D). The TLAM-D variant typically carries 166 submunitions, or bomblets, that can be dispensed over one, two, or three targets. The TLAM-D is equipped with an RSS, and therefore does not have parachute recovery capabilities. The one TLAM-D tested on the East Coast by special waiver was equipped with inert bomblets.

- The unitary variant (TLAM-C). TLAM-C variants tested on the East Coast would carry inert ballast to simulate a 1,000-lb (454-kg), conventional ordnance warhead. These missiles can directly strike a target or simulate detonation over a target. All TLAM-Cs tested on the East Coast are equipped with REM (parachute recovery capability).

- The Tactical Tomahawk (TLAM-E) variant. TLAM-E is an updated, slightly smaller version of the TLAM-C. Small changes in design and manufacture have made the TLAM-E less costly to produce than the other variants. The biggest change from the TLAM-C is that the TLAM-E is equipped with an RSS rather than an REM, and consequently would have no parachute recovery capabilities. Those tested on the East Coast would be equipped with inert warheads only. This TLAM variant has not previously been tested at Eglin AFB or elsewhere on the East Coast.

The Tomahawk Land Attack Missile (TLAM)



There are four variants of the Tomahawk Missile. This is a simplified drawing with the most basic components depicted.

Not To Scale

Figure 2-1

- TLAM-N variants do not carry nuclear weapons or live ordnance but instead carry inert ballast in the payload and simulate detonation above a single target. Nuclear variants carry depleted uranium (DU) ballast within the payload to precisely simulate the weight of the actual warhead. All TLAM-Ns are equipped with REM; therefore, they have parachute recovery capabilities for soft landings.

2.2.1.2 Tomahawk Missile Chase and Support Aircraft

As many as seven aircraft typically can be involved in a TLAM flight test (Figure 2-2, Test Missile, Chase and Relay Aircraft, and Mission Control). Two-seat tactical jets (such as F-15s or F-16s from Eglin AFB) serve as the primary and secondary chase aircraft. These aircraft remain with the missile for the entire flight and are equipped with missile override and flight termination capability, as described below.

The primary chase aircraft accompanies the missile throughout the flight test, following as closely as a few hundred feet and at altitudes that are comparable to those flown by the TLAM. Aircraft always fly above the minimum altitudes allowed by the Federal Aviation Administration (FAA) for a particular airspace. The airborne missile flight safety officer (AMFSO) flies in the back seat of the primary chase aircraft and can override the missile flight control system if the missile fails or significantly deviates from the intended flight path. In the event of an anomaly, the AMFSO may assume manual control of the missile and can terminate the flight test if so directed by Range Safety (see Subchapter 3.2, *Public Health and Safety*, for a detailed discussion of flight safety procedures).

The secondary chase aircraft, flying in formation with the primary chase aircraft, is a backup for the primary chase aircraft. As such, it is also a two-seat aircraft with an AMFSO in the rear cockpit. Should a problem with the primary chase aircraft arise, the secondary chase aircraft would assume responsibility as the primary chase aircraft.

Another jet may fly above or in front of the two chase aircraft formation at a predetermined altitude and distance. The mission of this aircraft is to communicate with the FAA on the status of the mission, the location of the missile and chase aircraft, and the status of IRs (if any are used) during the mission. This aircraft also relays real-time situational awareness information (weather conditions, air traffic, etc.) to the other two chase aircraft throughout the mission.

A telemetry and voice relay aircraft (e.g., E-9) flies at approximately 17,500 ft (5,334 m) mean sea level (MSL) on a completely separate ground track to record and relay missile telemetry and to provide a voice communications relay between the chase aircraft and the ground-based control room. This aircraft also may conduct area monitoring and clearance prior to sea launches. Depending on the test mission length, a second telemetry and voice relay aircraft may be used. A tanker aircraft (e.g., KC-135 usually provided by the Air National Guard) is positioned at approximately 20,000 ft (6,096 m) MSL to refuel the chase aircraft in the air. A minimum of two helicopters are used for missile recovery in case of an emergency missile termination or crash.

2.2.1.3 Additional Test Assets

Sea Surface Crafts. During submarine launches, a launch area support ship (LASS) may be positioned alongside the submarine at a distance of approximately 1,500 ft (457 m). The LASS provides communication relay capabilities between the submarine and the Navy Test Conductor. The LASS also provides a visual reference for chase crews, assisting them in locating the submarine. The LASS is usually a US Coast Guard cutter.

Vehicle Use and Access. A number of motor vehicles are required to support each missile test. These vehicles transport personnel, equipment, and targets to the testing areas and, if necessary, provide security and fire suppression. Roads in and around the target areas are used to the greatest extent possible.

Observation Equipment. High-speed missile impact photographic and video records are required to obtain high-quality test data. Remotely- and manually-operated, tripod-, truck-, and trailer-mounted camera and video equipment are deployed in and around the target area. Where dedicated power lines are not already available, generators, extension cords, and antennas are also required to support the test.

Remotely-operated, high-speed film and video cameras are mounted on tripods and are placed in and around the target area. Approximately 15 to 20 of each camera type may be used for each test. Antennas are placed next to each remote camera to relay electronic operating signals. These antennas stand approximately four to six ft (two m) tall and resemble a large microphone stand with a cone, approximately 12 in (31 cm) long, extending horizontally at the top of the pole. The remote cameras are operated from the range control center or control room.

Where power service is not available, the remote cameras and telemetric equipment are powered by trailer-mounted gas or diesel generators, each producing approximately 60 to 80 kilowatts of electricity. As many as 20 generators could be used for each test. Trucks tow the generators to the site using existing roads. The generators are placed close to the cameras, at the edges of the target area. Electrical extension cords are used to connect the generators to the cameras and video equipment.

Trailer- or truck-mounted cameras and video equipment are used to obtain wider photographic angles of various portions of the test. They are driven or towed by trucks using existing roads to be set up at the target area.

Meteorological Monitoring Equipment. During missile flight tests, a balloon is tethered immediately adjacent to the target to monitor weather conditions at the target area throughout the test. The balloon is typically blimp-shaped, made of thin plastic, and approximately six to ten ft (two to three m) long and three to six ft (one to two m) in diameter. It is filled with helium and is raised above the target site to measure wind speed and direction, visibility, barometric pressure, and ambient air temperature. Personnel use the balloon to monitor the weather until the missile is launched, at which time they evacuate to a predefined safety zone.

Test Missile, Chase and Relay Aircraft, and Mission Control

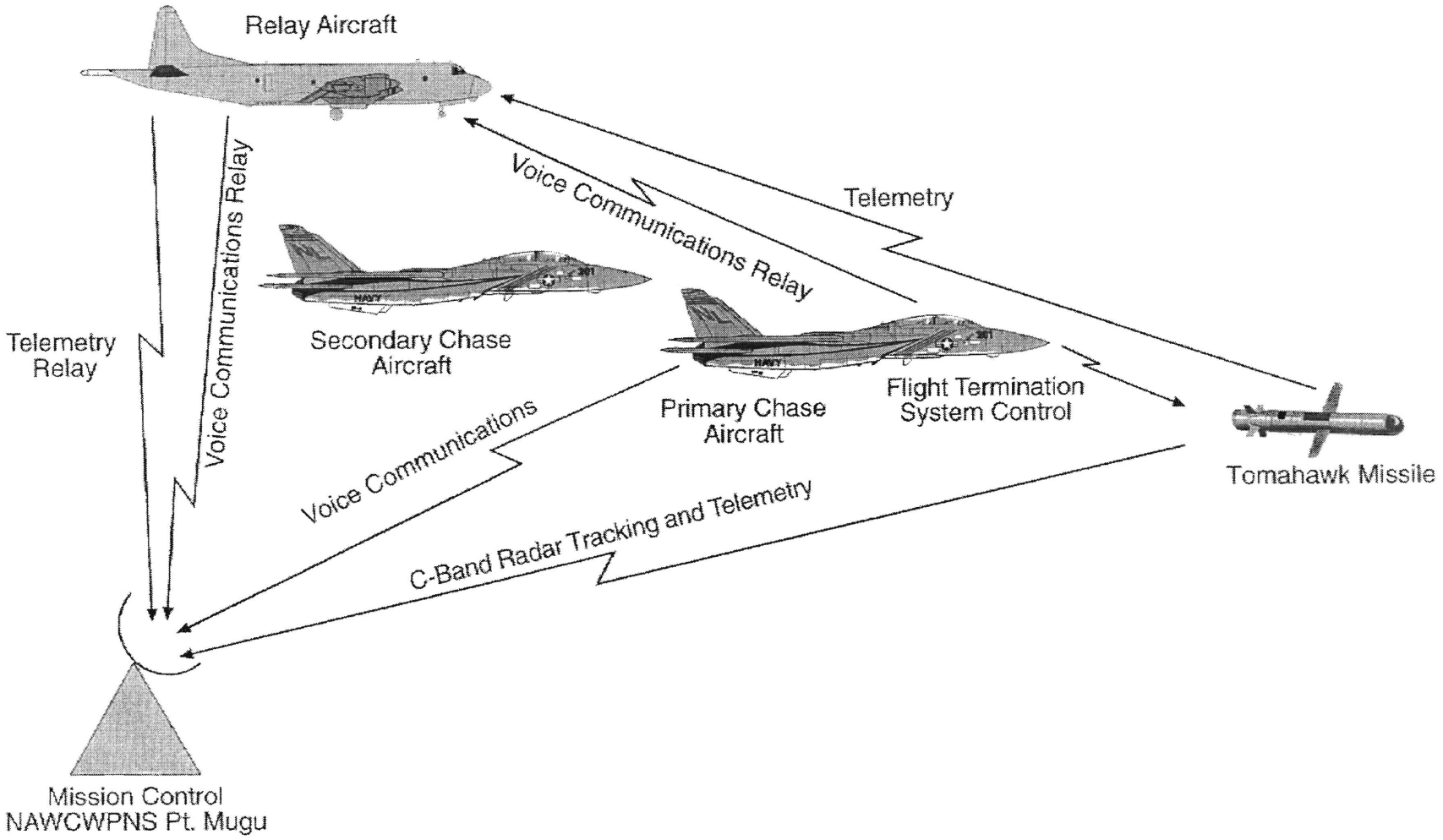


Figure 2-2

2.2.2 Test Scenario

The TLAM flight test can be divided into:

- A launch or "boost" phase, during which the missile is propelled upward by a rocket motor.
- A cruise phase, during which the missile is in flight to the target.
- A termination phase, when the flight test is ended either by directing the missile to impact a target, or to deploy its REM.

2.2.2.1 Tomahawk Missile Launch

The TLAM flight test team responsible for planning and conducting all TLAM tests on the East Coast is at Naval Air Warfare Center (Weapons Division) (NAWCWD), at Point Mugu, California. Planning for each TLAM flight test involves the flight test team, plus members from participating field activities.

Planning a TLAM launch begins several months in advance. Staging for the missile launch starts about 20 days before the scheduled launch. During this time, NAWCWD distributes a detailed Mission Firing Plan (MFP) covering all aspects of the upcoming launch to all test participants.

From this stage to one week prior to the launch, a message of instruction (MOI) is distributed to program personnel. The MOI is the final directive from the activity conducting the test to all participants, outlining all pertinent information (communication plan, brevity codes, assigned call signs, and the timeline). Within one week of the launch, the launch vessel (submarine or surface ship) is prepared for the launch, and pre-operation briefings are conducted.

At least two hours before the launch, the Navy Test Conductor (from the TLAM test conduct team at NAWCWD) assumes mission control of all participating units. Communication checks are conducted with the launch sites, and the launch vessel is confirmed to be within the designated launch area. Weather data are forwarded to the Navy Test Conductor. All efforts regarding roadblocks, photographic instrumentation setup, and range clearance are coordinated with the appropriate target range. Range clearance and weather reconnaissance aircraft take off two hours prior to launch. At 60 minutes before launch, a refueling tanker is on station, and range clearance operations are underway and nearing completion.

The TLAM is launched from areas designated for military activities. There are no restrictions on non-military aircraft in these areas since they occur over international waters, nor are there restrictions on surface vessel traffic. The controlling agency for the specific warning area notifies civil, general, and other military aviation through notice to airmen (NOTAM) advisories of any scheduled test flights and a Notice to Mariners (NOTMAR) for control of non-participatory watercraft in/near the launch hazard area. The Navy, sometimes with the assistance of the US Coast Guard, clears the launch hazard pattern (area within which the booster rocket and other hardware is jettisoned during the launch phase: see Figure 2-3, TLAM Launch Trajectory and Booster Impact Area), or waits until other vessels leave the area before launching the missile.

The launch hazard "footprint" is the area where the missile falls if a launch fails and where jettisoned parts fall (fin shroud, wing plugs, engine air inlet cover, and booster rocket). It is

defined by an arc extending 60 degrees to either side from the launch heading with a radius of seven nm (eight mi or 13 km), and an arc in the opposite direction of the launch with a radius of one nm (1.2 mi or 1.9 km). Launch sites are selected to ensure that the hazard area remains over water, well away from land, populated areas, and to the extent practicable, sensitive marine resources such as concentrations of marine mammals.

Missiles on the East Coast are launched from ships or submarines. Figure 2-4 (TLAM launch Sequence) shows a typical launch sequence. A missile can be launched vertically from a surface ship, or it can be launched vertically or horizontally from submarine torpedo tube. (TLAM-Ns can only be launched from submarine torpedo tubes.) In the case of a ship launch, the booster engine is ignited within the launcher and propels the missile away from the ship. In the case of a vertical or horizontal submarine launch, the missile is first propelled out of the submarine by an expanding gas cartridge. After the missile leaves the torpedo tube or vertical launcher, a line connecting the missile to the launch vessel starts the booster engine.

Figure 2-3 shows the launch trajectory of the TLAM. The booster engine powers the missile upward to approximately 1,000 to 1,200 ft (302 to 366 m) above MSL. When the booster motor burns out, it is jettisoned and falls into the launch footprint. The turbofan engine then starts and powers the missile throughout the rest of the flight test. The entire launch sequence takes less than 20 seconds and occurs entirely over open water, always within an Eglin Water Test Area (EWTA), a warning area, or the contiguous US air defense identification zone (ADIZ).

AGL v. MSL

High altitudes are generally measured with an altimeter in feet or meters above MSL. Because topographic variations create difficulties when expressing low flight altitudes in MSL, low altitudes are measured in feet or meters above ground level (AGL).

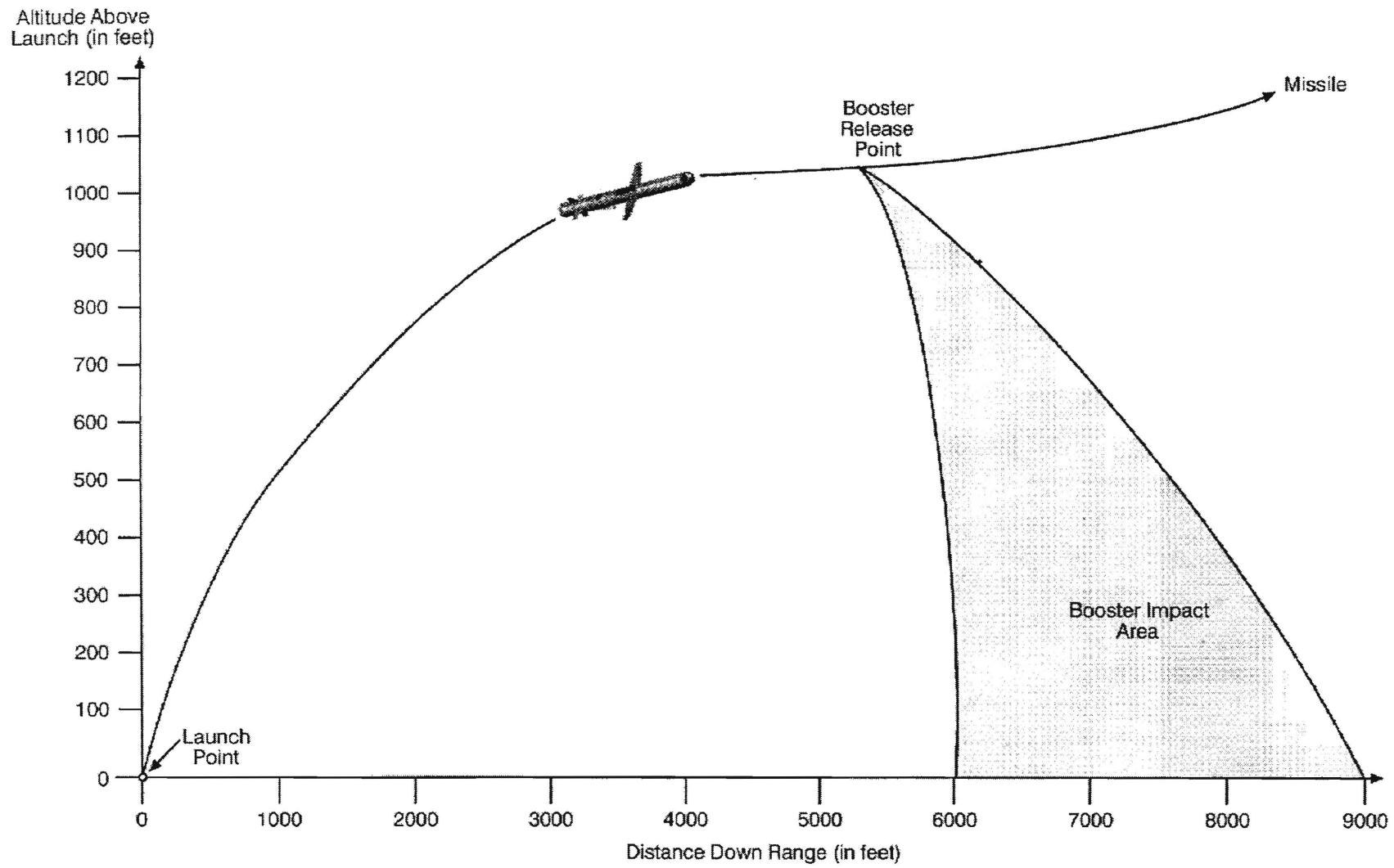
Before fins, wings, and the air inlet on the missile can be extended for flight, protective covers must be jettisoned. The guidance camera window cover also must be jettisoned for the guidance system to become operational. In the case of submarine vertical launches, an iron-filled foam casing (sabot) that covers the missile nose and prevents damage to the missile canister prior to launch also must be jettisoned.

All jettisoned missile hardware, such as shrouds, plugs, covers, sabot, and booster, are discarded within the launch hazard footprint, approximately 6,000 to 9,000 ft (1,829 to 2,743 m) downrange of the launch site and within an area of approximately 1,500 ft (305 m) to either side of the flight heading. The TLAM-D jettisons submunition payload cover doors as well but not until it reaches the test range near the target area. Materials jettisoned during a missile test are listed in Table 2-2. Jettisoned missile hardware is not recovered, with the exception of the TLAM-D payload cover doors, which are recovered at the target area.

2.2.2.2 Tomahawk Missile Cruise

After the turbofan engine is engaged, the TLAM flies its planned course to the target area. The missile is programmed for a specific altitude profile and surface track for each flight test. The missile guidance system includes navigation and computer systems used to guide the TLAM to its target. TLAM in-flight navigation systems include a global positioning system (GPS), terrain contour matching (TERCOM), and digital scene matching area correlation (DSMAC) systems. The DSMAC camera window aluminum-alloy cover is jettisoned by the missile flight guidance system at the appropriate time during the test flight (Table 2-2).

TLAM Launch Trajectory and Booster Impact Area

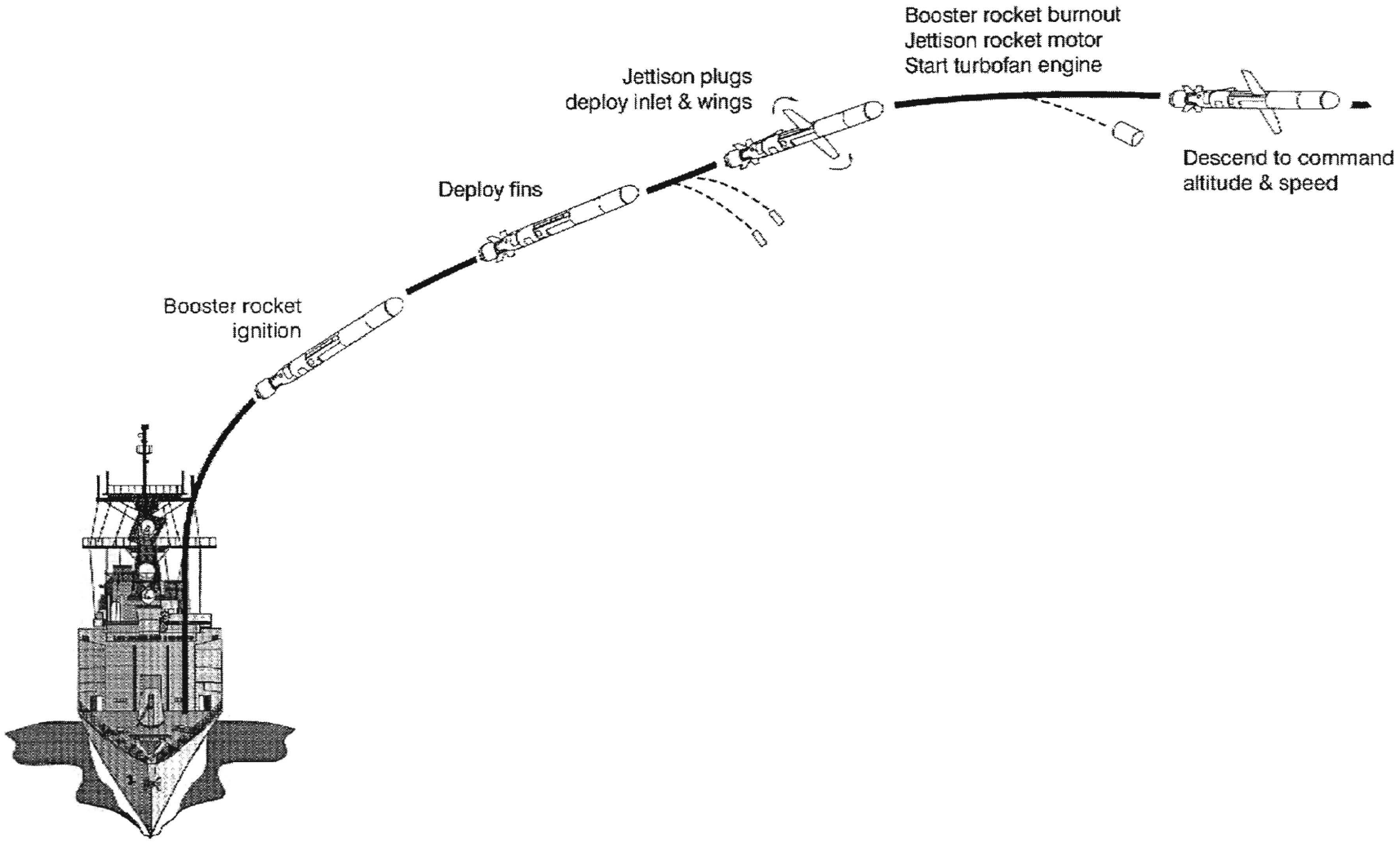


The booster motor is jettisoned at between 1,000 and 1,200 feet above MSL.
It falls between 6,000 and 9,000 feet downrange and within 1,500 feet to either side of the launch heading.

Not To Scale

Figure 2-3

TLAM Launch Sequence



The Tomahawk missile can be launched from land (for test launches), ship, or submarine. This is a simplified example of a ship-launched Tomahawk missile.

Not To Scale

Figure 2-4

Table 2-2
Items Jettisoned during Flight Tests

Item	Pieces	Piece Weight (lbs / kg)	Piece Size
Sabot (submarine vertical launches only)	2	13.25 / 6.01	Half-sphere – radius 11.6 in (29.5 cm)
Shrouds (submarine launches only)	2	31.15 / 14.13	20 in (50.8 cm) x 20 in (50.8 cm)
Air inlet cover	1	4.22 / 1.91	20 in (50.8) x 14 in (35.6 cm)
Wing slot plugs	2	0.53 / 0.24	20 in (50.8 cm) x 2.2 in (5.6 cm).
Solid booster rocket	1	300 / 136	Cylinder - 20 in (50.8 cm) x 24 in (61.0 cm)
Digital scene navigation system window cover	1	0.83 / 0.38	Circle - diameter 3 in (7.6 cm)
Submunition payload cover doors (at target site)	2	28.60 / 12.97	6 ft (1.8 m) and 2 ft (0.6 m)
Source: Crabbe 1997, in: Southwestern Division, NAVFACENGCOM, October 1998.			

During the cruise phase, the missile may pass over public and private lands. However, the TLAM is always within a military range during the termination phase. Immediately after launch and before the TLAM is permitted to fly over non-military land, an overall in-flight evaluation is conducted to determine compliance with pre-determined flight continuation criteria. Missile health, chase and support aircraft (see Figure 2-2), range support readiness, and weather conditions are considered. If any of the determining factors result in a "do not proceed" decision, the missile may be guided to a planned emergency termination/recovery area (Figure 2-5, Representative Footprint for TLAM Emergency Termination).

2.2.2.3 Tomahawk Missile Termination into the Target

The manner in which a TLAM attacks the target depends on the missile variant being tested. The following types of tests are conducted, individually or in combination:

- *Dispense/Impact* – The submunition variant (TLAM-D) dispenses inert submunitions, or bomblets, over one to three targets. This variant jettisons two payload cover doors before dropping the bomblets (Table 2-2). The payload cover doors are jettisoned onto the range approximately 450 ft (137 m) before reaching the missile's first target. Once all the bomblets are dispensed, the missile impacts at a planned location within the target area.

- *Hard Impact* – Some TLAM-C and all TLAM-E test variants directly impact a target after reaching the range. TLAM-C variants either climb and then descend into the target, or they horizontally attack the target. The TLAM-E can fly over a target several times simulating repeated target attacks, or flies over multiple targets and impacts a pre-planned location after the last fly-over.

- *Soft Impact (Parachute)* – Most TLAM-C variants and all nuclear test variants (TLAM-N) simulate missile detonation over the target. Instead of directly impacting the target, the missile deploys a parachute when it has reached the defined recovery area, after

overflying the target site. The parachute may also be deployed in the event of an emergency, depending on the best way to terminate the flight. The parachute allows the missile to be used again in future tests.

The hazard footprint at the target for inert TLAM-C, TLAM-D, and TLAM-E variants directed to a hard impact extends approximately 275 ft (84 m) from the target. The potential debris patterns for inert TLAMs are based on historical missile accuracy and test results. The recovery of debris would be conducted in accordance with the TLAM Range Recovery Plan (US Navy, 1989c) and in accordance with the US Environmental Protection Agency (USEPA) Munitions Rule (40 CFR § 266 Subpart M).

2.2.2.4 Missile Recovery and Cleanup at Target Area

A TLAM missile recovery plan has been developed specifically to define recovery safety criteria/procedures, equipment, and responsibilities for conducting recovery operations for all TLAM flight tests (US Navy, 1989c). Missile recovery procedures are coordinated with personnel at the target area range. As described above and as discussed in the approved missile recovery plan, missile components jettisoned during the missile launch (depleted booster engine, shrouds that cover the missile fins for submarine launches, and wing plugs) are not recovered.

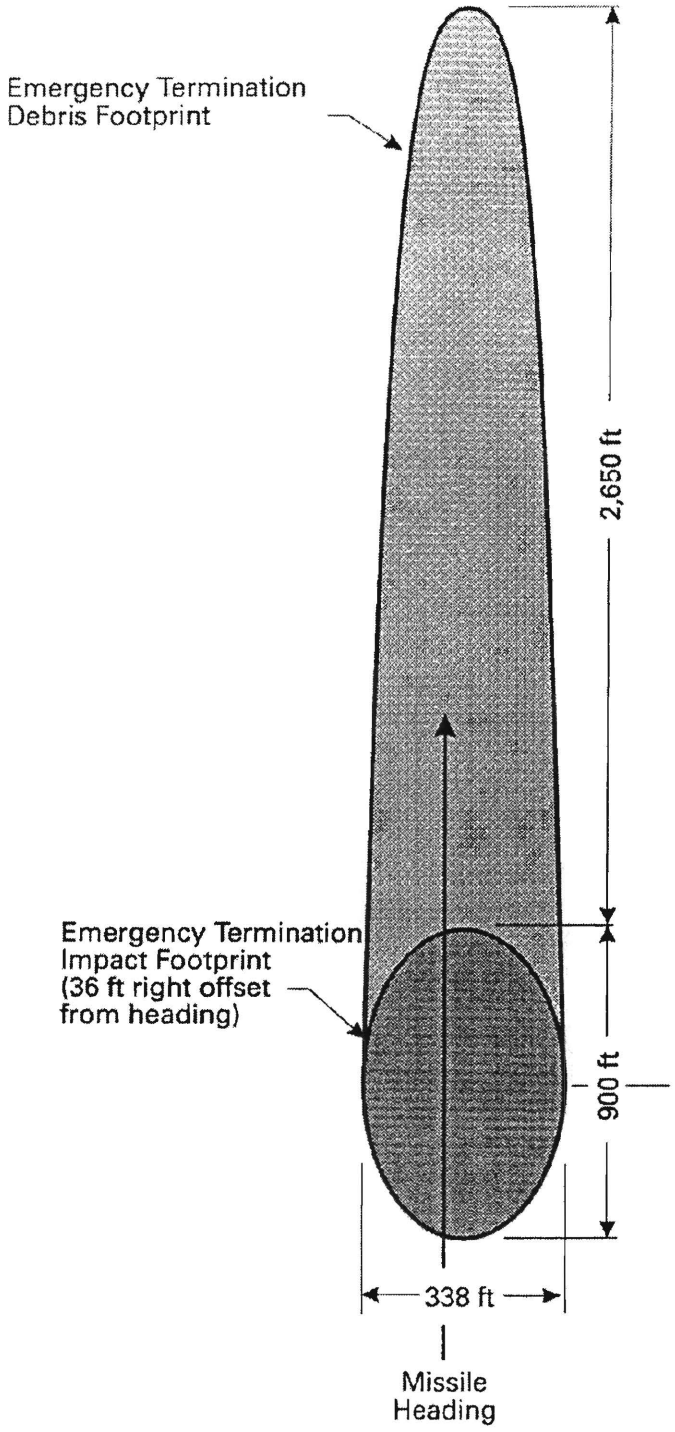
The submunitions variant (TLAM-D) discards payload cover doors prior to the target site and release of the bomblets. While onboard the missile, the bomblets are contained in molded rigid polyurethane foam packs. The foam packs break apart from the force of the air as they are ejected from the missile. The cover doors and the foam are usually found in the target area and are collected as part of the post-test cleanup process.

Most of the TLAM-Cs and all of the TLAM-Ns tested are REM-equipped and fully recovered. However, the ratio would shift towards RSS-equipped test flights over the next several years. For those test flights involving a hard impact (RSS equipped flights), program staff enter the area after the impact to evaluate and score the mission, and to collect all debris. At Eglin AFB, test areas are regraded after the equipment, target remnants, and debris are cleaned up. All cleanup efforts are conducted in accordance with the USEPA's Munitions Rule (40 CFR § 266 Subpart M). Depleted uranium (DU) ballast used for payload in TLAM-N variants is encased in a crash-proof container that prevents the release of the DU into the environment on impact. These containers are recovered during clean up. The recovery team also removes any residual JP-10 fuel that may not have been expended during the test flight and any fuel-contaminated soil.

2.2.3 Emergency Situations and Monitoring

The Navy has developed response procedures for emergencies that might develop during the TLAM flight test (US Navy, 1996f in: Southwest Division, NAVFACENGCOM, October 1998). To evaluate the missile health state and detect possible emergency situations, the TLAM guidance system constantly transmits telemetry data to the control room at Eglin AFB during the flight. The data provide real-time missile position and status information. Ground radar stations track the missile as an additional indication of position for comparison with missile telemetry data. Since missile telemetry data are continuously monitored during the flight and the crew in

Representative Footprint for TLAM Emergency Termination



Assumes TLAM altitude of 500 feet AGL, no wind, speed of 0.6 to 0.7 Mach, and a mid-cruise phase and EOC weight.

Not to Scale

Figure 2-5

the chase aircraft maintains visual contact with the missile, in-flight missile anomalies are quickly recognized and addressed accordingly.

The time TLAMs remain over water would vary dependent on the specific launch site and flight path. During that time, the missile's health and status are monitored very closely. A TLAM that exhibits an anomaly, or system failure, is not permitted to make "landfall." The AMFSO takes control of the missile and manually commands it to fly to one of the designated emergency termination areas. Missiles not equipped with a saltwater flotation device are retrieved by divers.

2.2.3.1 Emergency Termination

The TLAM itself is equipped with a fully redundant missile flight termination system. This system terminates the flight in case of system failure or persistent anomaly. It has three modes of operation:

- **Normal Mode** – Termination of a successful TLAM flight at the end of the test over a controlled area.

- **Emergency Mode** – Termination by the missile flight safety officer (AMFSO) at any time because of a missile anomaly. Activating this mode bypasses the missile's own guidance system, controls the missile, shuts down the engine, and deploys the recovery parachute if there is one. TLAM flight tests not equipped with recovery parachutes can be terminated by a hard impact into a designated emergency termination area, several of which are identified during launch planning. Emergency mode termination by the flight safety officer does not involve mid-air destruction of the missile by an explosive device.

- **Automatic Mode** – Activated if communication with the TLAM is lost or if the missile loses power. There are two automatic modes. If radio control is lost, the missile is programmed to proceed on course to a safe altitude of approximately 3,000 ft (914 m) AGL and, if contact is not reestablished, emergency termination is executed. If the missile loses power, its guidance system, operating on auxiliary power, programs it to climb to a minimum safe altitude of 2,300 ft (700 m), and emergency termination is executed. The TLAM is programmed to terminate into a pre-selected termination area if it is flyable to this area.

Emergency termination of a TLAM equipped with RSS (TLAM-E and TLAM-D) and, therefore, without parachute recovery capability, involves either the AMFSO (in Emergency Mode) or the Automatic Mode guiding the missile to the emergency termination area. The missile's speed is fixed at between 0.5 and 0.7 Mach (Mach 1 is equal to the speed of sound) and altitude at 500 ft (152 m) AGL. Termination mode is then executed, commanding a hard-over fin deflection, which causes the TLAM to become aerodynamically unstable and to tumble into the emergency termination area. The primary impact area is an oval that is approximately 900 ft (274 m) long and 336 ft (101 m) wide, offset from the missile flight track by approximately 36 ft (11 m) (the offset is due to the hard right turn that initiates the termination). A secondary debris area, extending approximately 2,600 ft (792 m) from the primary impact area, represents the maximum extent to which debris may be thrown. A typical missile emergency termination footprint is shown in Figure 2-5. Because of the manner in which the missile is redirected and

terminated, the hazard footprint for an emergency termination is larger than the hazard footprint for a typical hard impact into the target (approximately 275 ft (84 m) radius from the target).

Emergency termination for TLAMs equipped with an REM (parachute) package (TLAM-C and TLAM-N) similarly involves guiding the TLAM to a pre-planned emergency termination area. The missile is directed to climb to a minimum safe altitude of at least 2,000 ft (610 m). The 'recovery' mode is then executed, and the system deploys the parachute, slowing the missile descent to impact the ground at a velocity of 15 ft per second (4.6 m per second).

2.2.3.2 Missile Recovery at Emergency Termination Area

Although TLAMs that develop anomalies could be directed to the planned target, it is preferable to have contingency sites planned so the missile may be terminated without risk to instrumentation or personnel stationed near the planned target area. Emergency termination areas may be used to support soft- (parachute recovery) or hard-impact terminations on land or water. Because anomalies are most likely to occur during the launch or terminal phases of the flight test, emergency missile termination areas are located near launch and target areas.

It is not likely that a missile would suffer catastrophic failure during the cruise phase (see discussion of missile reliability in Subchapter 2.2.4 and 4.2). Missiles displaying minor anomalies during cruise phase may be directed to pre-selected emergency termination areas, located at the range or test area where the proposed target for that particular flight test is located.

Each TLAM is equipped with telemetry packages which transmit data back to the control center at Eglin AFB using radio beacons (235 kilohertz frequency) for land recovery of parachute-equipped missiles, and acoustic pingers (37.5 kilohertz frequency), which can be used to indicate the location of the missile should an underwater recovery be necessary. TLAM-Es are equipped with RSS; therefore, they do not contain the acoustic pinger or parachute found in the REM package.

A team of specialists from multiple government and contractor agencies accompanies the TLAM Testing Program launch team to the launch site and stands by during every TLAM test to recover the missile if it lands outside the designated termination area, and to conduct cleanup. The recovery team has all of the equipment necessary to safely secure and recover the missile. In the event of a hard impact that causes the missile's fuel supply to ignite, local fire fighting units are employed. Other appropriate federal, state, and local agencies, as well as private landowners, are notified immediately in the event of a missile recovery outside the designated termination area.

2.2.3.3 Missile Recovery Responsibilities and Procedures

Missile recovery responsibilities and procedures have been established in the *Missile Recovery Plan for West Coast Tomahawk Operations* (US Navy, 1989b) and the *Preliminary Tomahawk Cruise Missile Recovery Plan* (US Navy, 1998), and are outlined below.

- **Ocean Impact, Missile Intact and Floating** - Chase aircraft circle the area until an alert helicopter arrives, with a response time of 10 to 30 minutes. This helicopter carries the Initial Response Team, which comprises the On-Scene Commander, divers/swimmers, and Explosive Ordnance Disposal (EOD) personnel. Using normal ocean recovery

procedures, the helicopter transports the missile to a designated land base for further processing (transport to Tucson for failure investigation or to Sandia National Laboratories for the warhead parts in the case of TLAM-Ns).

- **Ocean Impact, Missile Intact but Sunken** – Using the missile's acoustic pinger for localization, and depending on water depth, divers or deep submergence vehicles recover the missile. Divers are available through various EOD Units (Mayport/Jacksonville, Pensacola). Deep submersibles are available through Deep Submergence Units or Supervisor of Salvage and Diving (SUPSALV). The missile is raised and placed aboard a surface support vessel for transport to an appropriate land base and further processing (transport to Tucson for failure investigation or to Sandia National Laboratories for the warhead parts in the case of TLAM-Ns). When the missile cannot be retrieved immediately, the search continues until it is terminated by the Program Executive Officer for Strike Weapons and Unmanned Aviation (PEO(W)).

- **Ocean Impact, Missile Broken-up and Sunken** - Salvage is attempted using divers or deep submersibles coordinated by the TLAM Recovery Team Leader. If the payload is shattered, the contents are retrieved to the maximum extent practicable. The search continues until it is terminated by PEO(W). EOD personnel take charge of the payload/fragments for transport to Tucson for failure investigation or to Sandia National Laboratories for the warhead parts in the case of TLAM-Ns.

- **Land Impact, Missile Intact** – Normally, the chase aircrew observe the TLAM impact and circle the impact area. In the event that the missile eludes the aircrew, the radio beacon aids in locating the missile. For TLAM-Ns, security is provided by EOD personnel who are trained and armed to secure and quarantine the area around a mishap site. These personnel are part of the Initial Response Team, who are later augmented by additional personnel in the Mishap Response Team.

- **Land Impact, Missile Broken-up** - The location is immediately identified and security immediately established as described in the paragraph above. Naval Air Station (NAS) Mayport and NAS Pensacola EOD/Security retrieve the missile components. All necessary protective gear and equipment are provided by NAS Mayport or Pensacola. If the payload is intact, it is returned to Mayport or Pensacola for shipment to Sandia National Laboratories.

When the payload is shattered and its contents scattered, the TLAM Security/Recovery Team is augmented by trained EOD personnel who alone handle the payload/fragments. To the extent practicable, all parts of the payload are recovered and placed in properly-marked containers. When the NAS Mayport and/or NAS Pensacola EOD team has packaged the TLAM payload/fragments and declared the area safe for entry, the Security/Recovery Team enters the area to locate and package the residue in accordance with established procedures. For TLAM-N recovery, a determination of the local radiation count is first conducted to ensure that there is no impact to the natural "background" state.

The TLAM contains small amounts of Class C explosives for use as cover thrusters and parachute release cartridges. Class C explosives, also termed Division 1.4 explosives by the

Department of Transportation, are categorized as minimal hazard explosives whose effects are largely confined to the packaging, with no projection of fragments of appreciable size expected (Burke 1997, in: Southwest Division, NAVFACENGCOM, October 1998). EOD personnel assist in TLAM recovery operations and are responsible for any explosive retrieval and handling. NAS Mayport, FL provides EOD support for the portion of the flight close to that facility (around the launch area and the first landfall), and NAS Pensacola, FL provides support for the Gulf of Mexico over water portion of the mission and the Eglin-Alabama over land portion. EOD divers are also responsible for attaching flotation bags to the missile to safeguard against inadvertent sinking during the TLAM recovery process.

For TLAM-Ns, the Recovery Team supervisor takes custody of the salvaged parts for return to Sandia National Laboratories. The Initial Response Team and Mishap Response Team proceed with standard cleanup procedures to ensure that the impact sites are returned to their original condition. All cleanup is performed in conjunction with the landowner/administering agency.

2.2.4 Reliability

Since the onset of the TLAM test program, there have been 235 flight tests similar to the type covered in this EA/OEA. These flight tests span a period of over 20 years and have involved both new and mature missile systems. Several terms used in this section are defined as follows:

- **Anomaly** - A system of the TLAM is not functioning normally. Although the missile would still be controllable, the decision may be made to execute an emergency termination if anomalies persist.

- **Failure (System Failure)** - One of the missiles systems (subcomponents) fails. This can lead to an emergency termination if the missile is still controllable or to a crash if the system failure is catastrophic.

- **Emergency Termination** – The missile is guided to a preplanned emergency termination area and the flight is ended. The missile is guided to a soft impact for TLAMs with a REM (parachute) or a hard impact for TLAMs with a RSS. Emergency termination areas are usually located in the ocean over shallow water or near the target area within a defined military area.

The outcome of the 235 TLAM tests to date is summarized as follows:

- 186 flights were successfully completed (79.1%).

- 17 flights displayed anomalies and were terminated at a planned emergency termination area (7.2%).

- 22 flights experienced system failures during the launch phase and crashed within the restricted military range (9.4%).

- 6 flights experienced system failures during the cruise phase (2.6%) (rounding used in below percentages):

  - 4 crashed on nonmilitary land (1.7%).
  - 1 crashed in the ocean, within an established warning area (0.4%).
  - 1 was directed to a planned emergency termination area (0.4%).

- 4 flights experienced system failures during the termination phase and crashed within the designated military range (1.7%).

Thus, most TLAM system failures have historically occurred during the launch phase when transitions in missile function must occur, and features such as fins and wings are deployed. Deployment of TLAM features may involve discharging small Class C explosives to jettison protective covers. These deployment events represent the most likely contributor to missile failure and occur only during launch or termination phases of the flight when the missile is over military test ranges. Once the missile reaches cruise phase, functional changes do not occur. Only six missiles - a rate of 2.6% - have failed during cruise phase.

The six system failures during cruise phase since the inception of the TLAM Program are as follows: the first occurred in 1983 in California; the second occurred in 1989 in Florida; the third occurred in 1991 in Alabama; the fourth occurred in 1992, also in Alabama; the fifth was in 2001 in California near the NAWCWD Land Test Range; and the sixth was in 2003 over the Pacific Ocean. Four of these failures resulted in crashes on non-military land, one failure resulted in a crash in the water within an established warning area, and one failure was manually terminated in a designated emergency termination area. In each case no sensitive resources were affected, there was no significant environmental damage, and no one was injured in any of these incidents.

For each cruise phase failure, the TLAM Program has diagnosed the cause and has corrected the problems in subsequent TLAMs. Of the 66 missiles tested in the last five years, there have been two failures during the cruise phase:

2001: The missile was launched in the Pacific Ocean within the NAVAIR Sea Test Range, was healthy enough to make landfall, traversed IR-200, entered the Restricted Area over China Lake, and while there it experienced a Radar Altimeter failure. Override control was exercised (as planned, briefed, and expected), and the missile was manually flown to the designated Early Recovery / Termination Area within the NAVAIR Land Test Range.

2003: The missile was launched in the Pacific Ocean within the NAVAIR Sea Test Range. While over water, the chase aircrew commanded a successful climb. Once there and while in a pre-planned turn, the missile altimeter 'locked' onto the chase aircraft. This caused the missile to command an unexpected climb which was aerodynamically unsustainable. The missile departed controlled flight and crashed in the water within the NAVAIR Sea Test Range, a designated Warning Area.

Neither of these cruise phase failures led to a crash on non-military land. No sensitive resources were affected, there was no significant environmental damage, and no one was injured in any of these incidents. TLAM performance continues to indicate a very low percentage of failure during the cruise phase (3.0%) for the last five years.

2.3 Mission Requirements and Testing Protocol

The mission requirements and testing protocols outlined below illustrate the specific criteria that must be met by launch facilities and target areas for TLAM flight tests.

2.3.1 Requirements for Sea Launch Sites

Sea launch sites must meet the following criteria:

- Provide an operating area that can be controlled or monitored for aircraft, surface ships, and submarines. The Navy ensures the launch area is cleared of all non-participants prior to beginning the launch.
- Provide an area where TLAMs can be launched from ship or submarine and access a target that meets the requirements for TLAM testing, as stated below in Subchapter 2.3.3. There must be an IR or similar special-use airspace that connects the launch site to the proposed target area.
- Allow for overwater transitions from launch phase to cruise phase, as well as significant time for cruise and course correction. The launch area must be sufficiently far from the shoreline that the missile can be transitioned while still offshore, and to allow for termination if the test team detects anomalies in the flight.
- Provide access to overwater military airspace that permits high- and low-altitude flight to evaluate missile performance under uniform conditions. The chase and support aircraft must have enough time within special-use airspace to evaluate the missile's performance.
- Provide for missile flight over both sea and land during a single test, and over terrain that provides suitable navigation cues for DSMAC and TERCOM.
- Provide for training activities in proximity to the Second Fleet's area of operation. The Second Fleet operates from the Atlantic and Gulf coasts.

2.3.2 Requirements for Target Areas

Missile target areas must meet the following criteria:

- The missile must be able to approach the target at a low altitude (less than 500 ft [152 m] AGL). In the case of a DSMAC mission (where the DSMAC scene is overflown to update the missile's navigation system), the scene is overflown at a low altitude. In earlier missions this would happen fairly close to the target site; however, in recent years the distance between the DSMAC scene and the target has grown. DSMAC scene overflights are still fairly low altitude flight events (less than 500 feet [152 m]). In the

case of a low approach, pop-up, and dive type attack, the missile comes in low and then proceeds with its terminal maneuver.

- Targets must be accessible – to install instrumentation (such as cameras), to collect data, and to retrieve the flight test missile or debris at the conclusion of the test.
- Targets must be accessible through IRs for missiles launched from sites that meet the requirements for TLAM testing, as stated above in section 2.3.1.
- Targets must have permanent scoring facilities and systems, and have facilities to receive, record, and decode the complex TLAM telemetry. The purpose of the flight test is to both assess and monitor the missile's performance, and to train the sailors in the deployment of the missile from shipboard. To do this, there must be a means of recording the missile's position during all three phases of the test flight.
- Suitable DSMAC and TERCOM areas must be available at the targets or along flight paths to the targets, to test the missile's guidance systems.
- Target areas must meet range safety requirements with regard to the proximity of people and facilities.
- The range or target area must provide the capability to accommodate the frequency of testing required without interfering with other ongoing operations.

2.3.3 Facilities That Meet Mission Requirements and Testing Protocol

Facilities on the East Coast that meet the mission requirements and testing protocols for the TLAM launch and target areas are discussed below.

2.3.3.1 Launch Areas

The Navy considered a number of potential launch areas off the East Coast. Some of these launch areas, namely the W-122 and W-72 warning areas off the coast of North Carolina and the W-102 and W-103 off the coast of Maine, have been rejected because they are associated with targets that do not meet the requirements for TLAM test flight targets (see Subchapter 2.3.4).

Only Eglin AFB targets meet the requirements for TLAM test flight targets. Thus, the suitable launch sites are:

- The EWTAs and the warning areas that adjoin the EWTAs (W-151, W-155, W-470, W-168) that collectively make up the Eglin Gulf Test Range in the Gulf of Mexico, and adjoining W-174 (used by NAS Key West).
- W-157 and W-158 in the Atlantic Ocean off the east coast of Florida (used by FACSFAC at NAS Jacksonville).

- The contiguous US ADIZ somewhat north of W-465, off Miami.

These launch areas meet all the mission requirements and testing protocols for TLAM sea launches, as stated in Subchapter 2.3.1. These ranges offer controlled air and surface spaces for hazard control; sufficient space for missile transition to cruise phase; sufficient airspace to accommodate overwater flights at unlimited altitudes; flights over land and sea; and training in reasonable proximity to the Second Fleet, which is based in Norfolk, Virginia.

The Eglin Gulf Test Range provides access to IR-30/31 (Florida and Alabama), while the W-157 and W-158 warning areas off the east coast of Florida provide access to IR-32/33 (the Cross-Florida Route) and IR-15 (the alternate inland IR to Eglin for IR-32/33). These IRs allow the TLAM to be launched from either the Gulf of Mexico or the Atlantic Ocean, and to execute long test flights over land or water with varying geographical features. They also provide access to several inland test ranges with existing target areas large enough to accommodate the hazard footprint for parachute recovery, hard impact with an inert warhead and emergency termination.

2.3.3.2 Target Areas

The Navy considered several potential target areas accessible to the Second Fleet, including four target areas at Eglin AFB, the G-10 and G-12 ranges at MCB Camp Lejeune (North Carolina), and one area (BT-11) under the control of MCAS Cherry Point (North Carolina), and the Navy Survival, Escape, Rescue, and Evasion (SERE) School grounds (Maine).

The North Carolina and Maine targets have been eliminated from further detailed analysis for reasons provided in Subchapter 2.3.4.

The TLAM Testing Program on the East Coast would involve only inert warheads. Thus, the target area must be large enough to contain the ground-disturbing activities and debris from delivery of inert TLAM test variants. The hazard footprint for impact by inert TLAM variants is generally a circular area extending approximately 275 ft (84 m) from the target. Generally, the hazard footprint is slightly smaller along the lateral axis than it is along the longitudinal axis relative to the missile's traveling direction immediately prior to detonation. The targets within B-70, B-75, C-52, and C-72 are large enough to include this footprint.

To date, East Coast testing of the Tomahawk has been conducted on the land and water ranges at Eglin AFB. TLAMs have been launched from the East Coast (Atlantic) and Gulf Coast (Gulf of Mexico) warning areas and have followed a programmed sequence to an impact area in the south end of Test Area B-70. In addition, it is proposed that the B-75, C-52, and C-72 test area also be used for TLAM testing (Figure 2-6, Eglin AFB Test Areas). Any of the targets within these test areas would be suitable.

2.3.4 Facilities Considered but Eliminated from Detailed Analysis

The Navy considered conducting test flights in North Carolina, launching the TLAM from warning areas off the coasts of North Carolina and Virginia, and terminating the flights either at BT-11 (controlled by MCAS Cherry Point) or the G-10 or G-12 impact areas at Marine Corps

Eglin AFB Test Areas

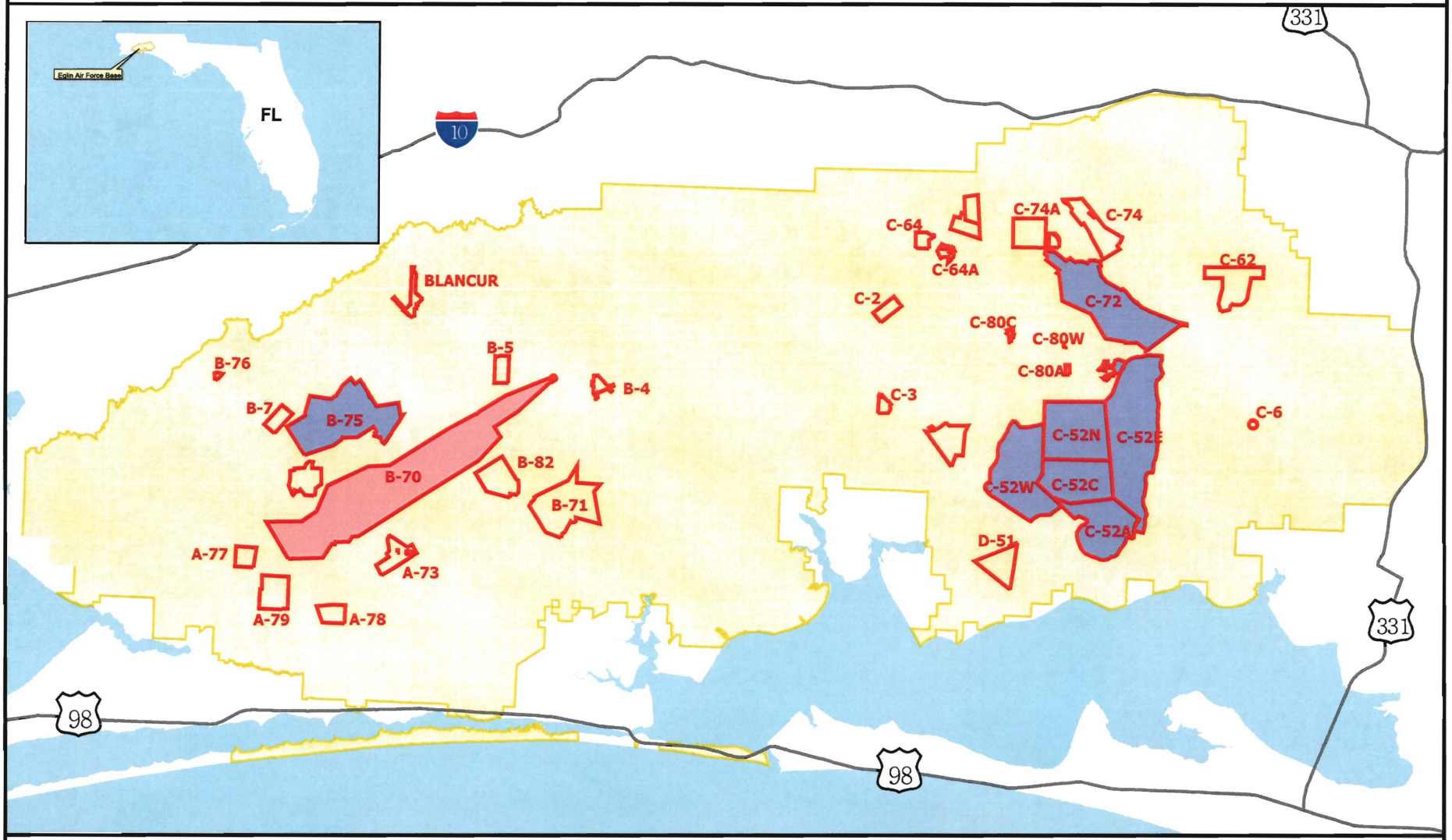


Figure 2-6

Base (MCB) Camp Lejeune. Both BT-11 and the MCB Camp Lejeune impact areas are established targets, and the test flights could make use of restricted area R-5306A.

However, both the MCB Camp Lejeune and MCAS Cherry Point target areas have been eliminated from further consideration because they do not meet mission requirements. MCB Camp Lejeune falls short because it:

- Would require flight through undesignated (non-special use) airspace.
- Would require overflight of the city of Jacksonville, North Carolina.
- Would interfere with scheduling of other ongoing training operations.

Another disadvantage is that the G-10 impact area is currently littered with unexploded ordnance (UXO). While the presence of UXO would not preclude the use of G-10 for TLAM test flight terminations, it would make the recovery of the missile much more difficult. It would require an EOD team to comb the area prior to extraction, and the extraction would have to be made by helicopter.

The MCAS Cherry Point BT-11 target would not be suitable because it:

- Would require flight through undesignated (non-special use) airspace.
- Would require low-altitude overflights of the Cedar Island National Wildlife Refuge, which is a popular tourist spot.
- Would require installation of permanent scoring facilities and telemetry systems.
- Does not have land available for DSMAC scenes or TERCOM.
- Is not very accessible for installation of continuous tracking cameras or other instrumentation (it is largely salt marsh with few roads or hard surfaces).

Other disadvantages include the difficulty of recovering the missile and any residual fuel in a marsh environment, and interference by waterfowl and other migratory birds. The Cedar Island National Wildlife Refuge hosts large concentrations of snow geese and other waterfowl in the winter.

The Navy considered conducting test flights off the coast of Maine, using launch areas within W-102 and W-103 (formerly used by Griffiss AFB and currently used by NAS Brunswick) and directing the missile to the Navy SERE School grounds in Remington. The Navy used the Maine testing facilities in the past primarily for the purpose of cold-weather testing of the TLAM. At present, the Navy does not foresee a continued need for this cold-weather testing. Further, the IRs that supported this testing (IR-850/851/852) have lapsed. Lastly, the SERE School grounds have never supported air-to-ground ordnance deliveries, and therefore fail to meet an important target area criterion.

The Navy also considered using W-72 and W-122 for test flights directed at MCB Camp Lejeune but has dropped further consideration of this alternative because MCB Camp Lejeune target areas do not meet requirements as above mentioned.

2.4 The No Action Alternative

The No Action Alternative would be to continue testing of the TLAM at current levels (up to 12 flight tests a year), using the EWTAs and associated warning areas, the warning areas east of Jacksonville, Florida, the ADIZ near Miami, and the targets at Eglin AFB Test Area B-70. New variants, such as the TLAM-E, would not be tested.

The No Action Alternative would severely undermine the Navy's ability to maintain the mission effectiveness of the Tomahawk Weapon System through production missile testing, system upgrade testing, and training exercises. The CEQ's NEPA implementation regulations recommend using the No Action Alternative to provide a measure of the baseline conditions against which the impacts of the Proposed Action can be assessed.

2.5 The Preferred Alternative

The preferred alternative evaluated in this EA/OEA is the Proposed Action, the testing of one new variant of the TLAM, the Tactical Tomahawk (TLAM-E), as well as the currently tested variants. Targets at three additional test areas at Eglin AFB would be used, as would special-use airspace established for use of these facilities. Test missiles would continue to be equipped with inert warheads. TLAMs would continue to be launched from all of the launch areas currently used, and at approximately the same rate (between 6 and 12 TLAM flight tests a year).

Because the proposed missile flight tests would involve only sea launches of missiles with inert warheads, the potential flight test scenarios are limited to:

- From the EWTAs and W-151, W-155, W-470, W-168, W-174, and W-465 to targets on Eglin AFB test areas B-70, B-75, C-52, and C-72. Test flights originating near Miami would be initiated in the contiguous ADIZ somewhat north of W-465, but most of the flight would occur within this and the Gulf of Mexico EWTAs and warning areas.

- From W-157 and W-158 off the east coast of Florida to the same targets on Eglin AFB.

All TLAMs flying over non-military land would follow established IRs. Missiles launched from the EWTAs or from warning areas that adjoin the EWTAs would be directed along IR-30/31 and terminated at one of the targets within the four designated test areas at Eglin AFB. Missiles launched from within W-157 and W-158 would be directed along IR-32/33, or a combination of IR-33/32 and IR-15, and terminated at any of the targets within the four designated test areas at Eglin AFB.

Flight tests would be conducted according to the flight-testing scenarios described above. The proposed testing locations meet the mission requirements and testing protocols outlined in Subchapter 2.3.

The flight tests would make use of established emergency termination areas, or the test teams would identify new emergency termination points as needed, and as each flight test is planned.

Emergency termination areas are selected based on their proximity to the launch and target areas, because most failures occur during the launch phase or very late in the terminal phase. For overwater areas, NAWCWD looks for locations where water depths are shallow enough to accommodate post-flight recovery of missile hardware. Overland areas are always on government-owned bombing or test ranges. IRs into these areas are unique to each flight test mission and take the most direct path into the termination area from the pre-planned mission route. Collectively, these emergency termination areas can support soft- or hard-impact terminations for flight tests originating from any of the proposed launch areas.

Preparation of the target area at the chosen test range would be required for all flight tests. Site preparation can include target construction and installation of data instrumentation. These procedures would require minimal ground-disturbing activity and would be conducted within the target's previously-disturbed area, or other disturbed areas, such as roads, to the greatest extent possible. Following the test, the missile, any debris, and data instrumentation would be removed from the target area, and the site would be restored to its original condition (see Subchapters 2.2.3.2 and 2.2.3.3).

Table 2-3
Summary Comparison of Impacts

Impact Area	No Action Alternative	Preferred Alternative
Land Use and Airspace	Continued use of special-use airspace (IR-0300/31, IR-032/033, & IR-015), restricted airspace (R-2914A, R-2915A, R2915B, & R2919A), & Eglin E MOA. Jettisoned missile hardware would continue to fall with the launch hazard pattern, and soft missile terminations would continue at Eglin AFB Test Area B-70.	Some missile terminations would be hard in addition to the soft missile terminations. Also, missile terminations would occur at Eglin AFB Test Areas B-70, B-75, C-52, and C-72. No impacts to Land Use and Airspace would occur as a result of the Proposed Action.
Public Health and Safety	Missile failure over populated areas (in the cruise phase) is calculated to be 2.6 percent. Risks from emergency terminations or hazardous materials would be low.	No change would be anticipated.
Air Quality	Minor, temporary, negative impacts on air quality would result from emissions associated with missile flight tests, launch vessels, chase and relay aircraft flights, vehicles, and generators.	No change would be anticipated.
Noise	Noise generated from TLAM testing would continue to be insignificant. Missile launches would continue to generate brief, impulsive noise with low to moderate risk of complaints. Short noises from landing and takeoff of aircraft would be consistent with overall current operations. Peak noise levels along an IR would be below the threshold for low risk of complaints. Noise from a low-flight missile near the target area would barely exceed the threshold for low risk of complaints; peak noise from low-flight chase aircraft would continue to result in the level for moderate risk of complaints at target areas.	No change would be anticipated.
Biological Resources	TLAM testing would continue to have terrestrial vegetative disturbance consistent with current use at test areas and very little impact on marine vegetation. Any wetlands within the TLAM hazard footprint would experience minor impacts from debris. Impacts on fishes and fish habitats would be negligible. The probability for a marine mammal or sea turtle to be struck or entangled by a failed missile or jettisoned debris would remain very low. Noise levels from a TLAM launch are well below the temporary threshold shift level for marine mammals, therefore marine mammals will not be affected. It is not expected that noise would significantly affect sea turtles either. TLAM flight tests may temporarily disrupt marine and terrestrial birds' feeding and nesting behaviors, but this is not considered a significant effect due to the short duration of the disturbance. Minor disturbances to terrestrial mammals, amphibians, and reptiles would occur as noise under the IRs and would be consistent with current use at Eglin AFB Test Area B-70. Only slight, if any, disruption to essential fish habitat may occur during TLAM testing. Threatened and endangered species would not be affected.	No change would be anticipated. As with Eglin AFB Test Area B-70, minor disturbances would be consistent with current use at Eglin AFB Test Areas B-75, C-52, and C-72.

Impact Area	No Action Alternative	Preferred Alternative
Cultural Resources	Submerged cultural resources and cultural resources beneath the IRs would not be affected by TLAM testing due to their sporadic locations and the low probability for missile failure during cruise phase. There are no identified cultural resources at Test Area B-70, and therefore, no impacts to cultural resources would occur from missile termination.	There are no identified cultural resources at Test Areas B-70 and B-75. The Proposed Action would also use existing target areas at Test Areas C-52 and C-72 which contain cultural resources. However the target areas within do not contain cultural resources and are currently used for similar testing, therefore no impacts would occur.
Water Resources	Given the low probability for missile failure, it is unlikely that water resources would be contaminated by jet fuel releases. For impacts over land, a spill response team would clean up any material, and if a small volume of fuel is released at sea, natural dilution would not warrant any human response. Also, Navy personnel routinely follow standard operating procedures in response to hazardous substance releases.	No change would be anticipated.
Environmental Justice	Given the diversity of populations near IRs, the No Action Alternative would not have disproportionately adverse environmental health or safety impacts to minority or low-income populations. Also, there would be no adverse health or safety impacts on children.	No change would be anticipated.

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3 AFFECTED ENVIRONMENT

This chapter provides a description of the environment that would be affected by the Proposed Action. The description is focused on those features of the environment that, because of the nature of the activities proposed, would potentially affect or be affected by additional testing of the TLAM on the East Coast of the US. Existing conditions are described for land use and airspace, public health and safety, air quality, noise, biological resources, cultural resources, and water resources.

The description focuses on the area of potential effect for each feature, which will vary according to the anticipated impacts. Most impacts would be confined to the TLAM launch and target areas. So, when appropriate, the discussion of the environment to be affected will be limited to launch and target areas. Since TLAM testing proceeds from launch to target, from the ocean to land-based targets, discussions of the affected environment in each section are organized in a similar manner.

Finally, Chapter 3 is organized to distinguish between descriptions of the affected environment pertinent to NEPA (the EA) and EO 12114 (the OEA). Descriptions of resources occurring in non-territorial waters are in italicized print.

3.1 Land Use and Airspace

This subchapter describes ongoing uses of the airspace that would be used for the East Coast TLAM Program and of the land and waters that underlie that airspace. This subchapter also provides a review of the land use policies that have been adopted by local governments in compliance with the federal Coastal Zone Management Act of 1972.

As outlined in the Description of the Proposed Action and Alternatives, TLAM launches would originate on ships or submarines operating within:

- The Eglin AFB overwater range (EWTAs) and adjacent warning areas W-151, W-155, W-168, and W-174, overlying portions of the Gulf of Mexico.
- Warning areas overlying the Atlantic Ocean off the northeast coast of Florida (W-157, W-158, not including 158F, near Jacksonville, Florida).
- W-465, near the Florida Keys, and the contiguous ADIZ slightly north of W-465.

The Navy would direct missile flights along any of several established IRs to reach land targets at Eglin AFB, including: IR-030/031 (Alabama), IR-032/033 (across northern Florida), and IR-015 (across FL panhandle). The flights would terminate at proposed targets already established within Eglin AFB (Test Areas B-70, B-75, C-72, and C-52). These targets are within restricted airspace controlled by Eglin AFB, namely R-2914, -2915, -2917, -2918, and -2919.

TLAM flight tests would be conducted almost entirely within designated military special-use airspace, including military training routes, restricted use airspace, and warning areas. Airspace designations throughout the US are controlled by the FAA and are applicable to all aircraft. These airspace designations are established to ensure compliance with FAA Order 1000.1A, Section 1006, which mandates compatible use of airspace by military and civilian interests. No changes in the FAA airspace designations are proposed as part of this action. Special-use airspace relevant to the Proposed Action includes:

- **Warning areas,** which are designated airspace for military activities in international airspace. There are no restrictions on non-military aircraft in warning areas since they are over international waters. Warning areas are designated by a "W" and a number. When in use, the controlling agency notifies civil, general, and other military aviation through notice to airmen (NOTAM) and notice to mariner (NOTMAR) advisories, which specify the current and scheduled status of the area and warn other aircraft.

- **Restricted use airspace**, which generally overlies land. It is used for military flight training and is not, for safety reasons, usually accessible to civilian or commercial aircraft. Restricted airspace is designated by an "R" and a number (e.g., R-5306) (Southwest Division, NAVFACENGCOM, October 1998).

- **Military Training Routes** (MTRs), which are military airways established to permit low-altitude, high-speed training. MTRs are designated as either visual flight route (VR) or IR. VRs are flown by maintaining a visual reference to the ground at all times, but the Navy does not propose to use VRs for TLAM testing. The MTRs proposed for use by the Navy are all IRs, which are flown using instrument flight rules enabling the aircraft to fly without visual reference to the ground. IRs 030/031 and 032/033 were established specifically for use by the Tomahawk Testing Program. IR-015 has been evaluated and approved for use by the Tomahawk Testing Program as an alternate IR for IR-032/033 (Naval Air Test Center, 1991).

- **Military Operations Areas** (MOAs), which are FAA-published blocks of airspace that warn the private and commercial users to expect joint military usage. Military usage can be at speeds greater than 250 knots below 10,000 ft (3,048 m).

Control of various special-use airspace is often delegated to a scheduling authority, which establishes restrictions on flights and use. TLAM flight tests on both the West and East Coasts are governed not only by the restrictions established for the specific special-use airspace, but also by the *Test Range Route Restrictions for Planning Tomahawk Test Missions* (NAWCWD, March 2000), the *Joint Range Safety Operational Plan* (US Navy, July 2002), and range users handbooks for each of the test ranges. These documents establish safety procedures for missile flights and flight restrictions for specific sensitive resources (SWDIV, NAVFACENGCOM, October 1998).

Most of the information provided in this section was obtained from the *Eglin AFB Mission Summary Report* (USAF, AAC, September 1996), the Eglin AFB Website, or the *Test Range*

Route Restrictions for Planning Tomahawk Test Missions (NAWCWD, March 2000). Other sources have been referenced where appropriate.

3.1.1 Gulf of Mexico Special-use Airspaces

For missile flights originating in or entering the Gulf of Mexico, the missile track must normally remain in W-155, W-151, W-470, W-168, W-174, or the EWTAs prior to entering an IR (NAWCWD, March, 2000). Figure 1-1 shows the EWTAs in the Gulf of Mexico and the warning areas in the Gulf and the Straits of Florida. With the exception of W-155, which is controlled by NAS Pensacola, and W-174 and W-465, which are controlled by NAS Key West (National Ocean Service Sectional Aeronautical Chart for Miami, September 2000), these special-use airspaces are controlled by the Air Armament Center (AAC) at Eglin AFB.

Collectively, the EWTAs and warning areas cover 86,500 square miles (sq mi) (224,035 square kilometers [sq km]) (USAF, AAC, September 1996) and include both deep and shallow water areas of the Gulf of Mexico and both US and international waters. Warning areas, by convention, are established over water, and few land areas (islands) occur beneath their footprints. W-151 and W-470 are the Gulf warning areas closest to Florida's shoreline, beginning about two nmi (2.3 mi or 3.7 km) from Fort Walton Beach and extending eastward through Cape San Blas. The six water test areas begin further offshore, linking W-168, W-470, W-151, W-174, and W-155 into a continuous overwater test area (USAF, AAC, September 1996; Eglin AFB Website, Undated) extending eastward almost to the western shore of Florida, westward to Mobile Alabama, and southward past the southern tip of the Florida peninsula and Key West. W-465 lies about 30 nmi (35 mi or 56.3 km) south of Florida's mainshore, and about 13 nmi (15 mi or 24.1 km) south of the Florida Keys. W-465 covers about 3,891 sq mi (1,008 sq km) of largely open water, with the western boundary of W-465A closest to W-174C. W-465 overlies the Straits of Florida, which links the Gulf of Mexico to the Atlantic Ocean around the southern tip of the Florida Peninsula.

3.1.1.1 Surface Uses

Inshore waters are used for shipping routes, commercial and recreational fishing, and other recreational pursuits. The northern Gulf of Mexico is one of the major recreational regions for the United States, particularly for marine fishing and beach activities. The major recreational resources include coastal beaches, barrier islands, coral reefs, estuarine bays and sounds, river deltas, and tidal marshes. Many of these are public use areas, such as parks, beaches, and landmarks. Commercial facilities such as resorts and marinas are primary focus areas for tourism.

In the vicinity of the EWTAs and Gulf warning areas, most boating activities occur in the Choctawhatchee Bay and adjacent areas of the Gulf of Mexico. At Destin Pass (East Pass), numerous boats pass from the Bay to the Gulf. Several commercial recreational fishing operators (party boats) operate from the Destin area. Recreational boating activities tend to be concentrated near population centers such as Panama City, Sarasota, and Fort Myers.

Shipping routes through the area originate at the two major commercial ports of Pensacola and Tampa Bay. The Intracoastal Waterway (IAWW), which passes through Choctawhatchee Bay and between the coastline and Santa Rosa Island, is also important. The IAWW is the most frequently used route for the shipment of commodities.

The Straits of Florida provide a major link between the Gulf and Atlantic coasts, and Gulf and Atlantic shipping. It is through the Straits of Florida that the Gulf Stream leaves the Gulf of Mexico and enters the Atlantic Ocean. The Straits also are an historically important route for immigration from Cuba to the US.

Offshore waters are also used for shipping and recreational boating. Shipping routes originate at ports but traverse the Gulf of Mexico.

No commercial petroleum or natural gas is currently being produced in the area of the Gulf or the Straits of Florida underlying the EWTAs and warning areas. There is presently a moratorium on all petroleum and natural gas exploration and production within the state of Florida's jurisdiction. However, several leases have been granted within federal waters. These leases are presently under review in connection with a proposed ban on drilling within federal waters underlying the EWTAs and warning areas.

The Gulf of Mexico is the single most important commercial fishing area in the US (USAF, December 2002). The major ports and their dominant fisheries along the Gulf coast of Florida include Appalachicola (oysters/shrimp), Fort Myers (black mullet/shrimp), and Key West/Marathon (shrimp/lobster/king mackerel) (Gulf of Mexico Coastal and Ocean Zones Strategic Assessment, Data Atlas 1985, in: Eglin AFB Website, Undated). Commercial fishing is generally concentrated along the coastline and extends west within the EWTAs and warning areas. Sport fishing generally occurs within this area and throughout the Gulf of Mexico.

Offshore waters are also used for commercial and recreational fishing. While commercial and recreational fishing is concentrated near shore, offshore waters are also used, particularly to capture pelagic, deeper water species.

Marine protected areas have been established throughout the US in compliance with EO 13158, *Marine Protected Areas*, to protect significant natural and cultural resources within the marine environment. Several marine protected areas are located below the Gulf of Mexico warning areas (Figure 3-1, Sensitive Areas – Florida). Many of these areas have fishing restrictions in place to protect fishery resources or spawning areas. Some protected areas, such as the Florida Middle Ground Habitat Area of Particular Concern, have fishing restrictions to protect bottom habitat or fragile coral resources.

The Florida Middle Ground Habitat Area of Particular Concern is 348 sq mi (901 sq km) and underlies W-470. It has an abundant coral/live bottom habitat area (US Department of Commerce, Marine Protected Areas Website, accessed July 2002).

Another marine protected area, the 2,800-sq nmi (3,708-sq mi or 9604-sq km) Florida Keys National Marine Sanctuary, lies within the Straits of Florida. It protects North America's only living coral barrier reef, over 500 species of fish, and other marine ecosystem resources (U.S.

Sensitive Areas - Florida

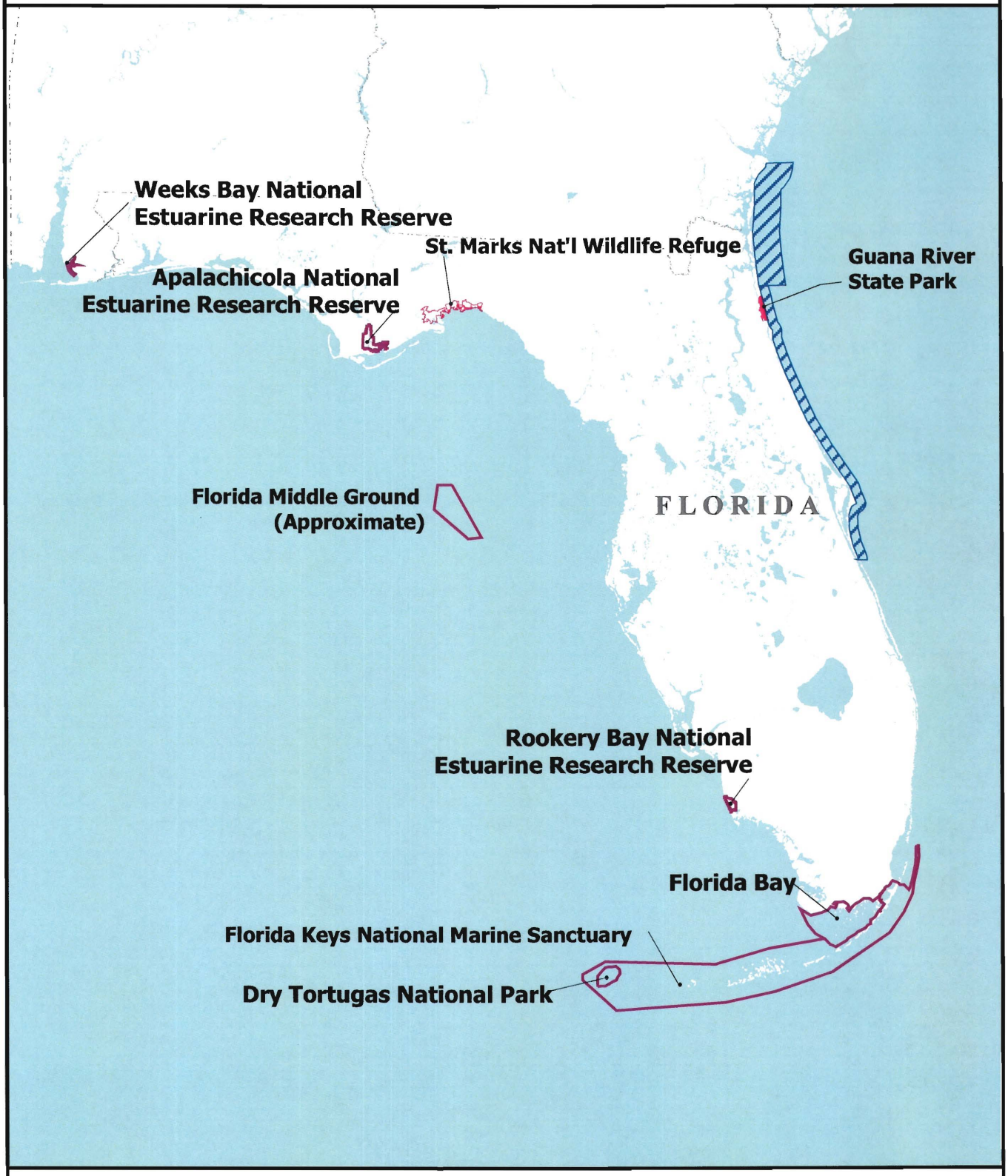

Figure 3-1

Department of Commerce, Marine Protected Areas Website, accessed July 2002). It is located approximately four nmi (4.6 mi or 7.4 km) north of W-465.

Many marine protected areas overlap the marine portions of national wildlife refuges. The National Wildlife Refuge System is a network of lands and waters managed for the conservation and restoration (where appropriate) of fish, wildlife, and plant resources and their habitat. Numerous National Wildlife Refuges dot the coast of Florida in the Gulf of Mexico, but all are located outside of the Gulf of Mexico warning areas (US Department of Commerce, Marine Protected Areas Website, accessed July 2002). Those refuges closest to warning areas are along the northern Gulf coast but are about three nmi (3.5 mi or 5.6 km) from the nearest (northern) boundary of the warning areas.

3.1.1.2 Airspace

The individual EWTAs, W-151, W-155, W-174, and W-470 include space from surface to unlimited altitude. W-168 includes space from surface to 24,000 ft (7,315 m) MSL (NAWCWD, March 2000). These areas have been used by the Air Force since the early 1940s for air-to-air, air-to-surface, surface-to-surface, and surface-to-air test and evaluation, as well as for military training exercises. The large size of the overwater range provides adequate space for the air combat maneuvers used in tactical training and development and for air-to-air missile operations. The overwater space provides a complement to Eglin AFB overland restricted airspace (R-2914, -2915, -2917, -2918, and -2919) and allows for a continuous interaction between water and land test areas.

Many test and evaluation programs are conducted within the airspace overlying the Gulf of Mexico, particularly within W-151 and W-470. The Advanced Medium Range Air-to-Air Missile, the Advanced Short Range Air-to-Air Missile, and Air Interceptor Missiles (AIM-7 and AIM-9) are tested in W-151. About twice a year, live missiles are fired against drone aircraft launched from Tyndall AFB. Supersonic launch tests for these systems are flown within W-470. Other air-to-air test and evaluation activities occurring over the Gulf of Mexico include aircraft and munitions systems compatibility tests, C4I, and electronics systems.

Some air-to-surface missile tests are performed in W-151. Weapon System Evaluation Program missions employing precision-guided air-to-surface weapons, including Maverick (AGM 65) and laser-guided bombs, also occur in W-151. Testing of the new AC-130U Gunship's 25-mm side-firing guns are tested in W-151.

Surface-to-air and surface-to-surface tests include sea trials and exercises where missiles are launched from surface vessels against subscale drones launched from Tyndall AFB. The TLAM Program presently uses the entire Eglin AFB complex (land and water ranges). TLAMs are currently launched from W-151 and follow a programmed sequence from the overwater range to an impact area at the south end of Test Area B-70.

Test profiles within the EWTAs permit the release of live or inert munitions, and supersonic aircraft operations. Use of the EWTAs is limited, because of the lack of instrumentation to support test and evaluation and the distances from land bases for training. The only current user on a regular basis is, in fact, the TLAM Program.

In addition to weapons systems and aircraft testing, the overwater areas, particularly W-151 and W-470, are used by a variety of organizations at Eglin AFB as well as by units outside Eglin AFB, for air-to-air and air-to-surface proficiency training.

W-465 includes space from surface to 70,000 ft (21,300 m) (W-465A and B) and from 21,000 ft (6,400 m) to 70,000 ft (21,300 m) (W-465C). W-155 includes space from surface to 60,000 ft (18,288 m) (W-155A and B). Military uses of these areas are primarily for air combat maneuvering and instrument training flights. W-155 includes space from surface to 60,000 ft (18,288 m) (W-155A and B).

3.1.2 Atlantic Ocean Special-use Airspaces

For tests beginning in the Atlantic, the flight, including the launch, must remain within W-157A, B, and C and W-158A, B, and E prior to entering the cross-Florida route, IR-033. Figure 1-1 shows W-157 and W-158 and entry points to IR-033 (NAWCWD, March 2000). The missile must generally remain out of W-159A and B (between the W-157 and W-158 areas) and W-158F.

W-157 begins about 25 nmi (28.8 mi or 46 km) off the Florida shore near Jacksonville, extends northward parallel to the shoreline, and consists of three subareas (A/B/C). It is about 27,605 sq mi (7,150 sq km) in area. W-158, separated from W-157 by W-159 (W-159 would not be used by the TLAM Program), begins about 18 nmi (20.7 mi or 33 km) off the Florida shore, somewhat south of Jacksonville, and extends southward, parallel to the shoreline. It is about 11,426 sq mi (2,959 sq km) in area. Both W-157 and W-158 are controlled by the Fleet Area Control and Surveillance Facility, Jacksonville Naval Air Station, Jacksonville, Florida.

3.1.2.1 Surface Uses

The major ports of commerce in the northern Florida region include Charleston, South Carolina; Savannah and Brunswick, Georgia; and Jacksonville and Cape Canaveral, Florida. In addition, there are numerous harbors and marinas that support small commercial vessels and recreational watercraft. There are no designated shipping channels in the region, but there are short entrance channels for the ports of Savannah, Brunswick, and Kings Bay in Georgia, and Mayport and Cape Canaveral in Florida. Ship traffic in the vicinity is substantial, particularly in the north-south direction (SOUTHDIV, NAVFACENGCOM, December 1999).

Offshore ship traffic is also substantial. Commercial vessels heading north generally stay within the Gulf Stream to take advantage of the current to carry them north to Cape Hatteras. When heading south, ships tend to stay inshore of the Gulf Stream, to avoid the current flowing counter to their direction of travel (SOUTHDIV, NAVFACENGCOM, December 1999).

There are no active petroleum lease blocks, pipelines, or platforms within the area of W-157 or W-158. (Personal Communication with Doug Oliver, Florida Department of Environmental Protection, August 16, 2002). On 12 June 1998, President Clinton issued an EO, which prohibited leasing in the Atlantic Outer Continental Shelf through June 2012 (SOUTHDIV, NAVFACENGCOM, December 1999).

As is the case with the Gulf coast, most commercial and recreational fisheries off the Atlantic coast of northeastern Florida, such as shrimp trawling, reef fishing, and king mackerel fishing, take place in inshore waters (SOUTHDIV, NAVFACENGCOM, December 1999). *A portion of a marine protected area – the Southeastern Right Whale Critical Habitat – lies below W-158E near Jacksonville, Florida where IR-032/033 begins to traverses northern Florida (Figure 1-1) (U.S. Department of Commerce, Marine Protected Areas Website, accessed July 2002).*

Certain offshore species, particularly oceanic pelagic and deep reef fish known to occur off the northeastern Florida coast such as sharks, swordfish, and tuna, are sought by commercial and recreational fishermen. These species are caught with surface drifting longlines. A bottom longline fishery for golden tilefish also occurs off Mayport, Florida (SOUTHDIV, NAVFACENGCOM, December 1999).

3.1.2.2 Airspace

Warning areas W-157A and W-158A include altitudes from surface to 43,000 ft (13,106 m) above MSL. W-157B and W-158B include altitudes from surface to 24,000 ft (7,315 m). W-157C includes altitudes from surface to only 5,000 ft (1,524 m). W-158E includes altitudes from surface to 1200 ft (366 m). As indicated, TLAM flights must remain out of warning areas W-159A, B, and W-158F.

Military use of this airspace includes both air and surface gunnery and missile exercises. Antisubmarine and torpedo exercises are conducted in W-157 and W-158.

3.1.3 IRs

Figure 1-1 shows the IRs proposed for use. All IRs have been used before for TLAM testing.

IR-031 begins east of Destin, Florida, and proceeds northwest to a point near US 31, then to a point seven mi (11.3 km) west of McCullough, Alabama, then north to US 84. From this location it heads to a point two mi (3.2 km) northeast of Oakhill, Alabama, then southeast into R-2914 (NATC, April, 1984). IR-030 is the same IR but in a reverse direction.

IR-033 begins within W-158A, and proceeds west making landfall near St. Augustine, Florida. It proceeds somewhat southwest, over the St. Johns River, then turns due west south of Kingsley Lake. It passes west just south of Starke and north of Fort White, and turns southwest again at US 19, terminating in W-470A. The TLAM can then be directed over water to targets at Eglin AFB from W-470, or alternately be directed northwest from the point it crosses US 19 to IR-015, and then to targets at Eglin. IR-032 is the reverse IR for IR-033.

IR-033 joins IR-015 at a landfall point 20 mi (32 km) south of Tallahassee, Florida, and about 20 mi (32.2 km) east of Perry, Florida, on Appalachee Bay. IR-015 begins on the coast of Appalachee Bay and passes westward across the northern part of Appalachee Bay. Just inside the Tyndall MOA is the City of Blountstown, where IR-015 turns west and enters the Eglin AFB range facility, then terminates (NATC, 1991; National Ocean Service [Sectional Aeronautical Chart for Jacksonville], September 2000).

3.1.3.1 Surface Uses

IR-030/031 was established for the TLAM Program in 1984. The land underlying IR-030/031 includes largely forest, marshland, and farmland. The forests include the Conecuh and Appalachicola National Forests and the Blackwater State Forest. Forests and marshland are primarily mixed pine and cypress and provide good wildlife habitat. The farmlands are generally small plots of field crops and pasture. The IR does not cross over any heavily populated areas. The closest populations are at Brewerton, Alabama, five mi (eight km) to the southwest of the IR, and Florala, Alabama seven mi (11.3 km) to the northeast of the IR (NATC, April 1984).

IR-032/033 was established in 1991 using the shortest reasonable IR (considering other airspace and land uses in the vicinity) to connect the Atlantic warning areas to IR-015 and the Gulf of Mexico. The routing of the IRs was selected to avoid populated areas and cross a rural area of the state. IR-033 crosses Florida's eastern shore at South Ponte Vedra Beach, an urban area consisting primarily of single-family dwellings, small businesses, and tourist/vacation residences (i.e., hotels, motels, and cottages). Transiting west and crossing the St. Johns River to Starke, the terrain beneath the IR is low-lying forest with numerous creeks. Forests in this part of Florida are generally comprised of several species of pine interspersed with pockets of live oak and water oak. Lakes and marshy areas are common.

As IR-033 passes west, it overlies several state parks (O'Leno, River Rise, and Ichetucknee Springs). The area is generally rural and lightly populated, interrupted by a few small cities and towns. West of Branford and extending to the Gulf of Mexico, the IR passes over a low-lying wooded swamp area that is sparsely populated.

Where IR-032/033 joins IR-015 on Appalachee Bay, the terrain is characterized again by wooded swamp typical of Gulf of Mexico estuaries. The swamp terrain extends to the Tyndall AFB MOA, with very few population centers along the IR. Just inside the Tyndall MOA the IR enters the City of Blountstown, where ground elevation rises to approximately 150 ft (46 m) above sea level. Pine forests dominate the landscape. (NATC, April 1991).

Numerous national parks, forests, and preserves underly or are located near the TLAM testing routes and areas. There are also numerous of state parks, forests, and recreational areas. This is partially the result of selecting routes and test areas to avoid populated areas.

There is also a portion of a National Estuarine Research Reserve (the Guana Tolomato Matanzas National Estuarine Research Reserve, near Jacksonville, Florida) located below IR-032/033. The National Estuarine Research Reserve System is a network of relatively prisine estuarine areas protected from development that serve as sites for research and education. A number of these reserves are located in Florida. The Guana Tolomato Matanzas National Estuarine Research Reserve is relatively undeveloped and representative of the coastal estuarine ecosystem in the southeastern US (US Department of Commerce, Marine Protected Areas Website, accessed July 2002).

Small areas in the southern portion of Saint Marks National Wildlife Refuge near Tallahassee, Florida are located under IR-015. Bradwell Bay Wilderness Area is also near Tallahassee, Florida and located under IR-015.

3.1.3.2 Airspace

The *Test Range Route Restrictions for Planning Tomahawk Test Missions* (NAWCWD), March 2000) and Appendix A of this EA/OEA provide a list of towns, cities, and other places where people are likely to be concentrated under the IRs, as well as industrial areas such as tank farms, that are considered "no-fly" areas along each of the Florida IRs presently used and proposed to be used for the TLAM Program. "No-fly" zones are areas where a lateral separation of one nmi (1.2 mi or 1.9 km) or more must be maintained between the flight path of the missile and chase aircraft and the noted feature. Exceptions include those flights employing TERCOM map usage. TERCOM flights are permitted overflights of these locations, but at higher altitudes, namely 3,000 ft (914 m) AGL. All IRs have been used for previous East Coast testing of the TLAM (NAWCWD, March, 2000).

The scheduling authority for IR-032/033 is the Fleet Area Control and Surveillance Facility in Jacksonville, NC. The scheduling authority for IR-015 is Moody AFB in Georgia. The scheduling authority for IR-030/031 is NAWCWD at Point Mugu, CA.

3.1.4 Eglin AFB

Airspace overlying land targets at Eglin AFB includes:

- Several **Restricted Areas**, namely R-2914A and B; R-2915A, B, and C; R-2917 (contained within R-2914A); R-2918; and R-2919A and B.
- **Military Operations Areas**, namely: Eglin MOA A East & West, Eglin MOAs B, C, D, E, F; and the Rose Hill MOA. Eglin MOA E overlies the restricted areas and IRs (USAF, AAC, January 1999).
- Additional **Special-use Airspace,** namely the North-South and East-West Eglin Corridors, as defined in Air Armament Center Instruction 11-201, and the Santa Rosa Island Controlled Firing Area).

Of these, R-2914A, R-2915A, R-2915B, and R-2919A, and the Eglin E MOA, can be used for the TLAM Program to provide flight access to the targets within the four potential test areas (B-70, B-75, C-52, and C-72) to be used for TLAM flight terminations. R-2915A and B cover the western third of the base (Figure 1-1), while R-2914A, R-2917, and R-2919A cover the eastern third. Collectively, they cover 991 sq mi (257 sq km). While the land beneath these areas consists mostly of the Eglin land ranges, the restricted areas extend off-base to Interstate 10 to the north and to the Intracoastal Waterway and Choctawhatchee Bay to the south. The eastern areas extend eastward to a point about 20 mi (32.2 km) west of Panama City.

3.1.4.1 Surface Uses

About 75 percent of the land area underlying the restricted areas to be used for TLAM testing is comprised of the Eglin land ranges. Non-military uses include Interstate 10 and smaller roadways; several small populations centers (DeFuniak Springs, Freeport, Galliver, and Holt)

located near the perimeter of the airspace; and a small corner of the Blackwater River State Forest.

The Eglin AFB land range encompasses 51 specific test and training areas. Each test area has been cleared or partially cleared of trees and ground cover (except grasses), and each has a distinct configuration for ease of identification from the air. The test area prefix letter A through D indicates the quadrant locations formed by the 30°30' N latitude line and the 86°30' W longitude line.

The four test areas to be used for TLAM testing are all currently used for a number of testing purposes. Relevant to TLAM testing, Test Area B-70 is primarily used for air-to-ground munitions tests, including bombs, guided missiles, rockets, and submunitions. It also has the capability to support incendiary and flame-weapons tests and laser weapons systems tests. B-70 is also used for surface-to-surface testing. The southern end of B-70 has been used for TLAM test launches from W-151 and for testing the Multiple Launched Rocket System. B-70 is about 13 mi (20.9 km) long by 1.25 mi (2.01 km) wide and is unique in that it underlies the only overland supersonic corridor east of the Mississippi River.

Test Area B-75 is about 3.5 mi (5.6 km) by 1.5 mi (2.4 km), and is used for air-to-ground bombing and rocket tests, a tank range, and a variety of ground static detonations. The test area is largely mown grasses, but includes two general-purpose clay cross targets and one 300-ft (91-m) by 1,200-ft (366-m) concrete runway target.

The C-52 Test Area is 28.5 sq mi (73.8 sq km) and encompasses a number of sub-areas, including C-52N, used for testing air-to-ground high explosive munitions, including bombs, guns, and rockets. An assault landing strip on C-52N is used for any testing that involves rough field landings and take-offs, cargo extractions, air assault landings, and parachute drops. C-52C is also used for air-to-ground munitions, generally involving testing of small munitions on a hard concrete surface. It includes a flame fuel area, submunitions clay grid, and two asphalt runways.

Test Area C-72 is 7.18 sq mi (18.60 sq km) and is used for both air-to-surface and surface-to-surface testing. It is used for determining the effectiveness of weapons/fuze combinations when delivered at various altitudes and airspeeds, and for determining the effectiveness of precision and wide-area coverage munitions against various targets. For surface-to-surface testing, the test area is equipped to support tests ranging from submunitions to complete guided munitions systems, such as Hellfire.

3.1.4.2 Airspace

As for the IRs, the restricted areas airspace includes "no-fly" areas (resorts, towns, power arrays, test area corridors, etc.). These "no-fly" areas are listed in Appendix A.

The overland regions of Eglin Restricted Areas airspace, MOAs, and special-use airspace support thousands of aircraft training and testing operation each year. (e.g., more than 40,500 sorties in fiscal year 2000). At the same time, Eglin overland airspace coexists with a number of public aviation interests, including a number of commercial and private airports and airfields within the region. Direct access by commercial or private flights into area airports is occasionally denied because of military use. However, in most cases, when one IR is closed because of

military activities, one or more others are opened to allow passage of nonmilitary aircraft (USAF, AAC, January 1999). Eglin AFB controls the restricted areas, while Jacksonville Air Route Traffic Control Center (ARTCC) grants approval for use of the MOA.

3.1.5 Coastal Zone Management

The coastal zone is rich in natural, commercial, recreational, ecological, industrial, and aesthetic resources. As such, it is protected by legislation for the effective management of its resources. The Coastal Zone Management Act (CZMA) of 1972 (16 USC § 1451, et seq., as amended) provides assistance to states, in cooperation with federal and local agencies, for developing land and water use programs in the coastal zone. This includes the protection of natural resources and the management of coastal development.

CZMA policy is implemented in the respective state coastal zone management programs. If the management program developed by the coastal state receives the National Oceanic and Atmospheric Administration's (NOAA) approval, the state is empowered by CZMA to review activities within or adjacent to its coastal zone to determine whether the activity complies with the requirements of the state's approved management program. Federal lands are excluded from the jurisdiction of these state coastal zone management programs, but activities on federal lands are subject to CZMA federal consistency requirements if the federal activity will affect any land or water or natural resource of the state's coastal zone, including reasonably foreseeable effects.

The landward boundaries of the coastal zone vary by state, reflecting both the natural and built environment. The seaward boundaries generally extend to the outer limits of the jurisdiction of the state, ranging from 5.6 km (three nmi) in the Atlantic Ocean to 16.7 km (nine nmi) to 22.2 km (12 nmi) in the Gulf of Mexico.

3.1.5.1 Florida

The Florida Coastal Management Program (FCMP) was approved by NOAA in 1981. The State of Florida's coastal zone includes the area encompasses by the state's 67 counties and its territorial seas. Therefore, federal actions occurring throughout the state are reviewed by the state for consistency with the FCMP. However, the state has limited its federal consistency review of federally-licensed and -permitted activities to the federal licenses or permits specified in Section 380.23(3)(c) of the Florida Code requested for activities located in, or seaward of, one of the state's 35 coastal counties (Florida Coastal Management Program Website, undated).

The State of Florida's federal consistency review is conducted jointly by its FCMP member agencies and is coordinated by the Florida Department of Community Affairs, which is the lead coastal agency pursuant to Section 306(c) of CZMA. During the review, each member agency with a statutory interest in the activity determines whether the proposed activity is consistent with its statutes and authorities in the FCMP. Recommendations regarding the activity's consistency with the FCMP are provided by the member agencies to the Florida Department of Community Affairs, which makes the state's final consistency determination (Florida Coastal Management Program Website, undated).

The FCMP consists of a network of 23 Florida statutes administered by 11 state agencies and four of the five water management districts. The 12 statutes with enforceable policies relevant to TLAM flight tests are:

- State Parks and Preserves.
- Recreational Trails System.
- Historical Resources.
- Saltwater Fisheries.
- Wildlife.
- Water Resources.
- Outdoor Recreation and Conservation.
- Pollutant Discharge, Prevention and Removal.
- Land and Water Management.
- Public Health.
- Environmental Control.
- Soil and Water Conservation.

Enforceable policies of the remaining 11 statutes are not relevant to TLAM flight tests primarily because there would be no construction or facility development that would require land use planning. Additionally, TLAM flight tests have no bearing on mosquito control or the exploration, drilling, and production of petroleum products. Non-relevant enforceable policies are listed as follows:

- Beach and Shore Preservation.
- Local Government Comprehensive Planning and Land Development Regulation Act.
- State and Regional Planning.
- Emergency Management.
- State Lands.
- Land Conservation Action of 1972.
- Commercial Development and Capital Improvements.
- Transportation Administration.
- Transportation Finance.
- Energy Resources.
- Mosquito Control.

The four Eglin AFB Test Areas, B-70, B-75, C-52, and C-72, that would be used for TLAM termination are spread out over three Florida counties: Santa Rosa, Okaloosa, and Walton. These three counties participate in the FCMP with coastal zone management regulations specific to their local government level. Santa Rosa County's current Comprehensive Management Plan contains coastal management policies designed to plan for, and where appropriate restrict, development activities where such activities would damage or destroy coastal resources, protect human life, limit public expenditures in areas that are subject to destruction by natural disaster, and promote the conservation, use, and protection of natural resources.

The goals the coastal management policies found in Okaloosa County's 2020 Comprehensive Plan are twofold. First, the county intends to protect coastal barrier islands and maintain or improve estuarine environmental quality by planning for and where appropriate restricting development that would damage these resources, while also providing public access for recreation purposes. Second, the county wants to protect human life and property, including historic resources, in locations subject to destruction by hurricanes in Okaloosa County.

Walton County's Comprehensive Plan, adopted in November 1996, addresses coastal management with policies designed to enhance resource protection by using development management techniques to control potential negative impacts from development and redevelopment.

3.1.5.2 Alabama

The Alabama Coastal Area Management Program (ACAMP) was approved by NOAA and has been in effect since 1979. Alabama's coastal zone consists coastal lands and waters seaward of the continuous ten-foot contour in Baldwin and Mobile counties, extending 22.2 km (12 nmi) into the Gulf of Mexico. Of these two counties, only Baldwin County has the potential to be affected by TLAM flight tests but does not have its own county-level enforceable policies specific to coastal zone management.

General rules applicable to all uses subject to the ACAMP include the following:

- Air and Water Quality Standards.
- Cultural Resources.
- Wildlife and Fishery Habitat.
- Public Access to Tidal and Submerged Lands; Navigable Waters and Beaches or other Public Recreational Resources.

Of these general rules, only air quality standards is relevant to TLAM flight tests. The remaining general rules are not relevant because there would no construction or facility development that would hinder public access to coastal lands.

Enforceable policies listed in the ACAMP that are not relevant to the proposed action include:

- Dredging and/or Filling.
- Mitigation.
- Marinas.
- Piers, Docks, Boathouses, and Other Pile Supported Structures.
- Shoreline Stabilization and Erosion Mitigation.
- Canals, Ditches, and Boatslips.
- Construction and Other Activities on Gulf Beaches and Dunes.
- Groundwater Extraction.
- Siting, Construction and Operation of Energy Facilities.
- Commercial and Residential Development.
- Discharges to Coastal Waters.

None of these policies is relevant to TLAM flight tests because there would be no construction, land-disturbing activities, energy development, groundwater extraction, or discharges to coastal waters.

3.2 Public Health And Safety

This subchapter describes the existing human population, and procedures currently used to ensure the protection of public health and safety during TLAM test flights. Much of the information is derived from the *Tomahawk Flight Test Operations on the West Coast of the United States, Final Environmental Assessment* (Southwest Division, NAVFACENGCOM, October 1998).

All TLAM tests on the East Coast are coordinated with the FAA. Operational safety, command, and control is provided by the NAWCWD Point Mugu test team personnel, stationed in an Eglin AFB Range control room, which is outfitted with specialized instrumentation and a well-trained, experienced organization. All TLAM flights are conducted during the day and only under clear conditions, and all airspace used in TLAM flight tests has already been designated for military use.

The Navy has specified "no-fly" areas, such as airports, resorts, industrial areas, and residential areas, along each of the overland flight routes that are used for the TLAM program. These "no-fly" areas are part of the *Test Range Route Restrictions for Planning Tomahawk Test Missions* (NAWCWD, March 2000) (see Section 3.1, Land Use and Airspace). All target areas are within military land ranges that are not accessible to the public and away from any residential areas. Other safety precautions are specified in the *Joint Range Safety Operational Plan for Tomahawk Land Attack Missile* (US Navy, 1992) and the *Missile Recovery Plan for West Coast Tomahawk Operations* (US Navy, 1989b) and are discussed below in the appropriate sections.

3.2.1 Human Population

3.2.1.1 County Data (Florida)

As stated previously, the routing of the IRs was selected to avoid populated areas and cross a rural area of the state. The recent availability of the 2000 US Census population data provides an opportunity to update the population data used in the routing procedure.

A comparative analysis of population data from the 1980, 1990, and 2000 US Censuses was conducted for the Florida counties underlying the IRs. Both absolute population growth and population density were included in the analysis. Overall data for the state of Florida were also provided as a benchmark. Table 3.2-1 summarizes the population data, and Table 3.2-2 summarizes the population density data.

Table 3.2-1
Selected State and County Population Data, Florida

	1980 Population	1990 Population	2000 Population	1980-2000 Population Growth	1990-2000 Population Growth
Florida (all counties)	**9,746,324**	**12,937,926**	**15,982,378**	**63.98%**	**23.53%**
Individual Counties Underlying IRs					
Alachua	151,348	181,596	217,955	44.01%	20.02%
Bradford	20,023	22,515	26,088	30.29%	15.87%
Calhoun	9,294	11,011	13,017	40.06%	18.22%
Clay	67,052	105,986	140,814	110.01%	32.86%
Columbia	35,399	42,613	56,513	59.65%	32.62%
Dixie	7,751	10,585	13,827	78.39%	30.63%
Gilchrist	5,767	9,667	14,437	150.34%	49.34%
Jackson	39,154	41,375	46,755	19.41%	13.00%
Lafayette	4,035	5,578	7,022	74.03%	25.89%
Leon	148,655	192,493	239,452	61.08%	24.40%
Liberty	4,260	5,569	7,021	64.81%	26.07%
Okaloosa	109,920	143,776	170,498	55.11%	18.59%
St. Johns	51,303	83,829	123,135	140.02%	46.89%
Suwanee	22,287	26,780	34,844	56.34%	30.11%
Taylor	16,532	17,111	19,256	16.48%	12.54%
Union	10,166	10,252	13,442	32.23%	31.12%
Wakulla	10,887	14,202	22,863	110.00%	60.98%
Walton	21,300	27,760	40,601	90.62%	46.26%
Washington	14,509	16,919	20,973	44.55%	23.96%
Subtotal IR Counties	**749,642**	**969,617**	**1,228,513**	**63.88%**	**26.70%**

Source: US Census Bureau, 2004.

Table 3.2-2
Selected State and County Population Density Data, Florida

	Land Area (square miles)	1980 Density/ Square Mile	1990 Density/ Square Mile	2000 Density/ Square Mile
Florida (all counties)	**53,926.82**	**180.73**	**239.92**	**296.37**
Individual Counties Underlying IRs				
Alachua	874.25	173.12	207.72	249.31
Bradford	293.13	68.31	76.81	89.00
Calhoun	567.31	16.38	19.41	22.95
Clay	601.11	111.55	176.32	234.26
Columbia	797.05	44.41	53.46	70.90
Dixie	704.01	11.01	15.04	19.64
Gilchrist	348.89	16.53	27.71	41.38
Jackson	915.64	42.76	45.19	51.06
Lafayette	542.84	7.43	10.28	12.94
Leon	666.74	222.96	288.71	359.14
Liberty	835.87	5.10	6.66	8.40
Okaloosa	935.63	117.48	153.67	182.23
St. Johns	609.01	84.24	137.65	202.19
Suwanee	687.64	32.41	38.94	50.67
Taylor	1,041.91	15.87	16.42	18.48
Union	240.29	42.31	42.67	55.94
Wakulla	606.66	17.95	23.41	37.69
Walton	1,057.56	20.14	26.25	38.39
Washington	579.93	25.02	29.17	36.16
Subtotal IR Counties	**12,905.47**	**58.09**	**75.13**	**95.19**

Source: US Census Bureau, 2004.

The population data indicate that while absolute population growth has fluctuated from county to county on a percentage basis, the population growth of the entire area subtotal of counties underlying the IRs has mirrored (within one-tenth of one percent) overall statewide population growth during the period between the establishment of the IRs and today. The population density data confirm that these areas underlying the IRs are low-population, rural areas in comparison to the rest of the state. The overall population density of the IR area subtotal is less than one-third of the state average of nearly 300 people per square mile. This includes counties with large cities (such as Tallahassee, in Leon County) that are not directly within the IR but where a lower-density portion of the county is underlying the IR. Finally, the data indicate that the IR area subtotal represents approximately 24 percent of Florida's total land area but represents less than eight percent of the state's total population.

3.2.1.2 County Data (Alabama)

A similar exercise was conducted for counties in Alabama underlying the IRs. Again, a comparative analysis of population data from the 1980, 1990, and 2000 US Censuses was conducted for the counties underlying the IRs. Both absolute population growth and population density were included in the analysis. Overall data for the state of Alabama were also provided as a benchmark. Table 3.2-3 summarizes the population data, and Table 3.2-4 summarizes the population density data.

Table 3.2-3
Selected State and County Population Data, Alabama

	1980 Population	1990 Population	2000 Population	1980-2000 Population Growth	1990-2000 Population Growth
Alabama (all counties)	**3,893,888**	**4,040,587**	**4,447,100**	**14.21%**	**10.06%**
Individual Counties Underlying IRs					
Butler	21,680	21,892	21,399	-1.30%	-2.25%
Clarke	27,702	27,240	27,867	0.60%	2.30%
Conecuh	15,884	14,054	14,089	-11.30%	0.25%
Covington	36,850	36,478	37,631	2.12%	3.16%
Crenshaw	14,110	13,635	13,665	-3.15%	0.22%
Dallas	53,981	48,130	46,365	-14.11%	-3.67%
Escambia	38,440	35,518	38,440	0.00%	8.23%
Lowndes	13,253	12,658	13,473	1.66%	6.44%
Monroe	22,651	23,968	24,324	7.39%	1.49%
Wilcox	14,755	13,568	13,183	-10.65%	-2.84%
Subtotal IR Counties	**259306**	**247141**	**250436**	**-3.42%**	**1.33%**

Source: US Census Bureau, 2004.

The Alabama population data indicate that while the state population grew by over 14 percent between 1980 and 2000, the counties underlying the IRs declined in population by over three percent. In the 1990-2000 period, state growth was approximately ten percent, while the IR subtotal grew by less than two percent. These counties are clearly in low-population, low-growth areas.

The population density data confirm that these areas underlying the IRs are low-population, rural areas in comparison to the rest of the state. The overall population density of the IR sub-area is less than one-third of the state average of approximately 80 people per square mile. Finally, the data indicate that the IR area subtotal represents approximately 18 percent of Alabama's total land area, but represents less than six percent of the state's total population.

Table 3.2-4
Selected State and County Population Density Data, Alabama

	Land Area (square miles)	1980 Density/ Square Mile	1990 Density/ Square Mile	2000 Density/ Square Mile
Alabama (all counties)	**50744**	**76.74**	**79.63**	**87.6**
Individual Counties Underlying IRs				
Butler	777	27.90	28.18	27.54
Clarke	1238	22.38	22.00	22.51
Conecuh	851	18.67	16.51	16.56
Covington	1034	35.64	35.28	36.39
Crenshaw	610	23.13	22.35	22.40
Dallas	981	55.03	49.06	47.26
Escambia	947	40.59	37.51	40.59
Lowndes	718	18.46	17.63	18.76
Monroe	1026	22.08	23.36	23.71
Wilcox	889	16.60	15.26	14.83
Subtotal IR Counties	**9071**	**28.59**	**27.25**	**27.61**

Source: US Census Bureau, 2004.

3.2.1.3 Population Centers (Florida and Alabama)

More detailed data describing the specific areas underlying the IRs were also generated and analyzed. These data (from the 2000 Census only) serve to eliminate any anomalies from the county census data (i.e., large cities well removed from the IRs) and ensure that the IRs are still consistent with the goals of avoiding or minimizing impacts to population centers.

The population centers underlying the IRs include the entire Florida communities of Alachua, East Raiford, Lake Butler, Middleburg, Perry and Starke, and portions of the Florida communities of Jacksonville, St. Augustine, Keystone Heights, Fort Walton Beach and Gainesville. A part of Brewton, Alabama is also included.

The estimated population of the specific communities and census tracts underlying the IRs is 297,890 in the Florida portion and 43,915 in the Alabama portion, for a total of 341,805 people. These figures represent approximately 24 percent of the county population identified as the Florida IR subtotal, and approximately 18 percent of the county population of the Alabama subtotal. The specific population centers underlying the IRs represent a small portion of the already low-populated areas in Florida and Alabama. Furthermore, the population density of the specific areas under the IRs is 53.19 persons per square mile in the Florida sections and 17.81 persons per square mile in the Alabama section. These population densities are 44 percent and 35 percent lower, respectively, than the already-low county densities, and are 80 percent lower than their respective state averages for population density.

3.2.2 Safety Precautions Prior to Flight Test

Before each test the TLAM Program takes the following safety precautions as part of the planning process:

- Computer simulations and analysis of the intended TLAM route.
- Briefing of all involved parties and test participants.
- Publication of NOTAMs and NOTMARs through the normal procedures of the FAA and US Coast Guard, respectively, detailing a block of time when the TLAM route would be active.
- Checks for all voice communications, tracking radar, and missile telemetry links.
- Launching of a preliminary flight by aircraft equipped with a missile guidance set to validate the proposed TLAM flight path.
- Designation of an airborne missile flight safety officer and backup flight safety officer aboard two separate chase aircraft.
- Designation of a range safety representative as the final authority on TLAM mission safety (US Navy, 1989; US Navy, 1992).

3.2.3 Safety Precautions at Launch Time

Under normal test launch procedures, the Navy actively clears the launch hazard area prior to a missile launch, using surface radar, aircraft, and sometimes smaller boats (such as the LASS, often provided by the US Coast Guard). Clearance aircraft ensure that both the surface and airspace are clear. Aircraft confirm any radar detections, or if radar systems are not available, a chase aircraft performs a visual search of the launch hazard area. Any confirmed detection of non-participating aircraft or watercraft within the launch hazard area results in stopping the launch countdown until the detection can be investigated and the hazard area cleared.

3.2.4 Safety Precautions during Flight Test

During the TLAM flight test, the following precautions are standard procedures:

- The missile is tracked with ground-based radar when within range.
- The missile is escorted by at least two chase aircraft in proximity and by another telemetry relay aircraft at a higher altitude (all aircrew have undergone specific training for escorting TLAM flights).

- The status of the missile sub-systems are continuously transmitted via telemetry from the TLAM itself to the Eglin AFB range, where systems analysts from NAWCWD Point Mugu and range safety officers from Eglin AFB monitor missile health.

- Continuous real-time radio and radar contact between the chase aircraft and the FAA also provides real-time position data of both the missile and chase aircraft throughout the TLAM flight.

- Air-to-air radar is maintained in at least one chase aircraft to detect nonparticipating air traffic.

- An override control system on all chase aircraft assigned to escort the missile is used if needed to guide the missile away from nonparticipating airborne traffic or to fly it to a safe area for termination if a missile anomaly occurs.

- If the command link between the missile and the range safety system is lost, the TLAM is programmed to gain altitude until contact is reestablished.

- If contact with the range safety system is not reestablished within a specified time, the automatic recovery or termination sequence (termination does not involve ordnance-induced missile destruction) within the TLAM is initiated.

- Properly trained missile recovery and security personnel are stationed in several locations along the mission route and are ready for quick response by helicopter in the event of unplanned missile termination (Southwest Division, NAVFACENGCOM, October 1998).

3.2.5 Depleted Uranium

TLAM-N test missiles carry depleted uranium (DU) that approximates the weight of a live nuclear warhead and serves as a counterbalance in the nose section of the missile. This is unique to the TLAM-N variant. All TLAM-N test missiles containing DU are equipped with REMs and do not impact target areas.

DU is not a weapons-grade radioactive material, but it is a heavy metal. It contains the radioisotope U-238 but is depleted of the more radioactive isotope, U-235. While DU is only about half as radioactive as naturally-occurring uranium (US Army Environmental Policy Institute 1994, in: Southwest Division, NAVFACENGCOM, October 1998), it is known to be a health hazard when taken internally via inhalation or ingestion. Its heavy metal characteristics are the primary concern, and its slight radioactivity represents a secondary concern.

The heavy metal toxicity of DU in humans is generally less than that of lead. Studies of acute poisoning from DU ingestion have reported kidney damage at doses as low as 0.1-mg/kg-body weight (US Navy, Undated c, in: Southwest Division, NAVFACENGCOM, October 1998). For the average 130- to 175-pound (60- to 80-kg) person, this represents the equivalent of ingesting approximately 0.0004 cubic centimeters of DU, a volume of material significantly smaller than a

single teaspoon. The primary route of potential exposure to DU associated with TLAM testing is assumed to be through inhalation of contaminated dust. Toxicity levels for exposure to DU by inhalation are not known; however, human health risks from inhalation are expected to be low. The amount of DU dispersed from a TLAM-N on impact, and therefore available for inhalation by humans, is small and does not approach toxic levels for exposure by ingestion.

DU is a relatively stable isotope with a 4.5 billion year half-life, where one half-life is defined as the time required for an element to lose approximately one-half of its radioactive intensity. DU emits low levels of alpha, beta, and gamma radiation but decays principally through alpha emission. The gamma emissions of DU are considered negligible. The exterior airframe of the TLAM-N shields the alpha and beta radiation, which are the predominant radioactive emissions of DU. Therefore, the human health hazard from direct radiation exposure is not considered significant (US Army Corps of Engineers 1997b, in: Southwest Division, NAVFACENGCOM, October 1998). In addition, the low level of radioactivity from natural uranium has not definitively been shown to cause cancer in humans or animals (ATSDR 1990, in: Southwest Division, NAVFACENGCOM, October 1998).

The ambient gamma radiation level around the nose of the TLAM-N is estimated at approximately about one millirem per hour (US Navy, Undated c, in: Southwest Division, NAVFACENGCOM, October 1998). The average annual radiation background exposure in the US is about 300 millirems, while the Nuclear Regulatory Commission (NRC) exposure standards for the general population and occupational workers are, respectively, 100 and 5,000 millirems per year above background (US Army Environmental Policy Institute 1994, in: Southwest Division, NAVFACENGCOM, October 1998). In comparison, acute human exposure to external radiation causing doses as high as 25,000 millirems (Burke 1997, in: Southwest Division, NAVFACENGCOM, October 1998) to 50,000 millirems (Doull 1980, in: Southwest Division, NAVFACENGCOM, October 1998) has resulted in no detectable symptoms. These data suggest that any short-term handling of DU components during TLAM-N recovery activities result in insignificant exposure doses relative to doses received annually from natural sources and within NRC's annual exposure limits relevant to both the general public and industry. Furthermore, DU ballast used for payload in TLAM-N variants is encased in a crash-proof container that prevents the release of the DU into the environment on impact. These containers are recovered during clean up.

US Air Force Flight Surgeon Major General Crouch has issued the following medical position on DU (US Navy, Undated c, in: Southwest Division, NAVFACENGCOM, October 1998):

> "The probability of personnel casualties being caused by radiation poisoning from DU is practically negligible. The material presents no external hazard. Moreover, when involved in fires or explosions, very little DU is converted to respirable particles. The radiation hazard is even less than the toxic hazard. When deposited internally, DU can cause a type of heavy metal poisoning which affects the kidneys. The toxicity is less than that caused by lead projectiles."

Therefore, the radiation characteristics of the DU contained in the TLAM-N are not considered to present a significant human health risk.

To further ensure safety of personnel during missile recovery, the depleted uranium contained in the TLAM-N has been combined with niobium to enhance oxidation resistance (US Navy, Undated, in: Southwest Division, NAVFACENGCOM, October 1998). The resultant alloy has been tested in jet fuel fires at 2000°F (1093°C) for 30 minutes with no significant oxidation or melting. Therefore, it is unlikely that significant amounts of respirable particles of depleted uranium are generated during a TLAM-N termination or recovery operation. In addition, the Navy employs standard operating procedures for recovery operations to ensure safety (see Section 3.2.9).

Any airborne emissions of the DU alloy that are generated as the result of TLAM-N impact or burning is primarily in the form of fugitive dust and particulates. The dust and particulates settle out of the air quickly. DU dust is much heavier than normal dust, and is usually deposited within approximately 160 ft (50 m) downwind of the impact or event that generated it (Paulson 1995, in: Southwest Division, NAVFACENGCOM, October 1998). The rapid and localized deposition of DU particles produces residual airborne concentrations well below the Occupational Safety and Health Administration (OSHA) time-weighted average (TWA) of 0.2 mg/m^3 established for insoluble uranium compounds (US Army Environmental Policy Institute 1995), an exposure level deemed acceptable by OSHA over a normal working lifetime. The remoteness of the launch sites, target areas, and emergency termination areas, and their restricted access, also minimizes the probability of public contact with DU used in the TLAM-N, and minimizes any risk to public health and safety.

3.2.6 Other Hazardous Materials

Each TLAM contains a solid fuel booster rocket used to propel the missile to flight altitude. The booster contains approximately 304 lbs (137 kg) of fuel at launch. This booster fuel consists of arcadene, ammonium perchlorate, aluminum, carboxyl-terminated polybutadiene, and various catalysts/plasticizers. Under standard operating conditions, the solid fuel burns completely before the empty booster breaks away and falls into the sea or onto the land range. The booster rocket is jettisoned within one to 1.5 nm (1.2 to 1.8 mi or 1.8 to 2.8 km) down range of launch and well within designated launch hazard areas (see Section 3.2.2). Malfunction of the booster can cause unburned solid fuel to be released, but clearing the launch hazard area prior to launch prevents contact by the public. Furthermore, the solid-matrix formulation of the booster fuel significantly minimizes the dispersal pattern of any released fuel and, consequently, reduces the area impacted by any premature discharge of a TLAM booster rocket.

JP-10 is the jet fuel used for TLAM flight operations (US Navy, Undated c, in: Southwest Division, NAVFACENGCOM, October 1998). JP-10 is composed primarily of petroleum distillates in the kerosene range and has a minimum flash point of 130°F (54°C) and a minimum auto-ignition temperature of 474°F (245°C). Each TLAM carries an initial fuel load of approximately 600 lbs (272 kg) (about 100 gallons [380 liters]). When JP-10 is spilled, the fuel vaporizes quickly, resulting in an insignificant impact to the surrounding environment. While JP-10 fuel is not considered explosive, JP-10 vapors can explode when heated. The major hazard for JP-10, however, is fire caused by spilled fuel coming into contact with an open flame or ignition

source (fire response is considered as part of the missile recovery procedures outlined in Section 2.2.3).

Each TLAM also contains two lithium active batteries. The first lithium battery serves as a power source for TLAM instrumentation while the second lithium battery is used for the missile recovery beacon. Lithium batteries can overheat, vent potentially hazardous gases if broken open, and react explosively if shorted. As such, the safety risks posed by lithium batteries on the TLAM are similar to those hazards posed by standard, commercially available, active lithium batteries. In addition, the missile's lithium batteries are encased in fire retardant material to minimize the effects of any prolonged exposure to excessive heat.

3.3 Air Quality

The area of potential effect for air quality impacts varies according to the type of air quality being discussed. Primary pollutants, such as carbon monoxide and directly-emitted particulate matter, have localized regions of influence generally restricted to the immediate vicinity of the emission source, namely the TLAM missile and associated equipment. Secondary pollutants, such as ozone and secondary particulate matter, may be affected in a broader region that includes the counties through which the TLAM missile and associated equipment operate. These test launch areas, flight routes, and target areas have been described in Subchapter 3.1.

3.3.1 Ambient Air Quality Standards

The USEPA, under the requirements of the 1970 Clean Air Act as amended in 1977 and 1990, has established National Ambient Air Quality Standards (NAAQS) for six contaminants, referred to as criteria pollutants (40 CFR Part 50): carbon monoxide, nitrogen dioxide, ozone, particulate matter, lead, and sulfur dioxide. The ambient air quality standards include primary and secondary standards. The primary standards are established at levels to protect public health with an adequate margin of safety. The secondary standards are established at more stringent levels to protect the overall public welfare.

Areas that meet the NAAQS standard for a criteria pollutant are designated as being in "attainment." Areas where the criteria pollutant level exceeds the NAAQS are designated as being in "nonattainment." In turn, nonattainment areas are subcategorized based on the severity of their pollution problem (marginal, moderate, serious, severe, and extreme). When insufficient data exist to determine an area's attainment status, it is designated unclassifiable or in attainment. A "maintenance" area is an area that is currently re-designated as an attainment area from a former nonattainment area. However, most of the CAA rules for a nonattainment area are still applicable to a maintenance area.

3.3.2 Clean Air Act Conformity Requirements

In addition to establishing the NAAQS, the Clean Air Act Amendments of 1990 expanded the scope and content of the Clean Air Act's conformity provisions by providing a more specific definition of conformity. As stipulated in Section 176(c) of the Clean Air Act Amendments, conformity is defined as "conformity to the State Implementation Program's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards." The USEPA published final rules on general conformity that apply to federal actions in designated nonattainment or maintenance areas for any of the criteria pollutants under the Clean Air Act (40 CFR Parts 51 and 93) in the November 30, 1993 *Federal Register*.

3.3.3 Study Area

The warning areas, IRs, and testing areas that would be used to implement the Proposed Action in Florida and Alabama are all within areas that are in attainment for all criteria pollutants with one exception. IR 032/033 is above part of Duval County, Florida, which is designated as a maintenance area for O_3. Therefore, the rule on general conformity is only applicable to the small portion of the IR operations that are within Duval County area.

3.4 Noise

Typically, noise is measured in units called decibels (dB). Since the human ear cannot equally perceive all pitches or frequencies, these measures are adjusted or weighted to compensate for the human lack of sensitivity to low- and high-pitched sounds. This adjusted unit is known as the A-weighted decibel, or dBA. The A-weighted network, which de-emphasizes very low- and very high-pitched sounds, is the network most often applied to urban and suburban noise-generating activities such as traffic.

Other frequency-weighting schemes are used for specialized purposes. The "C-weighted" decibel scale (dBC) is often used to characterize low-frequency sounds, such as those produced by detonations capable of inducing vibrations in buildings or other structures. The C-weighted scale does not significantly adjust the measured level for low-frequency components of a sound.

Another factor important in characterizing and analyzing noise is whether the noise source is continuous or impulsive. Continuous noise sources include those sources resulting from highways, construction sites, and aircraft traffic at large airports or air stations. Impulsive noise sources are those typically found at military installations or training ranges where noise is generated by the discharge of weapons and ordnance. Impulsive noise sources are fundamentally different from continuous noise sources. Thus, the criteria for measuring impulsive noise are different than the criteria used for measuring for continuous noise. Permanent damage to unprotected ears from continuous noise can occur at approximately 85 dBA (A-weighted decibel scale) based on an eight-hour-per-day exposure, while the threshold for permanent damage to unprotected ears due to impulsive noise is approximately 140 dBP (peak decibel) based on 100 exposures per day (Pater, 1976).

Since the TLAM test occurs only 12 times or fewer each year, and during each test a person on the ground is exposed to flight-generated noise for only 21 seconds (given the speed of the TLAM and accompanying aircraft), potential noise impacts are of short duration and are similar to those from impulsive noise events.

The US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has provided guidelines for evaluating peak blast impulsive noise levels generated from military tests and training. Although these criteria (see Table 3.4-1) have never been officially adopted, the Army has used them for many years, and their use has been confirmed by a USACHPPM study, which correlated annoyance with measured dBP (US Army National Guard Bureau, 1996). The study concluded that:

- dBP criteria are useful for noise complaint management and investigations.
- dBP provides a good estimate of the perceived vibration of typical residential construction resulting from blasts.

Table 3.4-1
Impulse Noise Guidelines

Sound Level(dBP)	Risk of Complaints	Action
< 115	Low	Fire all programs
115 – 130	Moderate	Fire important tests; postpone noncritical testing, if feasible
130 – 140	High, and possibility of damage	Only extremely important tests should be fired
> 140	Threshold for permanent physiological damage to unprotected ears – High risk of physiological and structural damage claims	Postpone all explosive operations

Source: USACHPPM, May 2001.

3.4.1 Special-use Airspaces

TLAM launches presently occur offshore, in an open-sea environment. General background unweighted noise levels of the open sea are approximately 46 dBA (Richardson, et al., 1995). No sensitive noise receptors would be located in the vicinity of the launch area due to clear zone restrictions.

3.4.2 IRs

TLAMs tested on the East Coast, for the most part, pass over land areas that are military installations, agricultural fields, forested swamps and marshes, open water, and other open spaces. Some small residential areas underlie the IRs used. With the exception of military installations, noise from wind and limited amounts of vehicular traffic or agricultural equipment are the dominant noise sources in these areas. Daytime background noise levels along much of the TLAM test area are estimated to be approximately 50 to 55 dBA.

3.4.3 Eglin AFB

Missile flights terminate at the Eglin AFB B-70 Test Area. The noise environment at Eglin AFB is comprised of many diverse sources, including general traffic from military and civilian aircraft, military aircraft on low-level or supersonic missions, and traffic on local highways. Single-event impulsive noise, resulting from munitions or weapons testing, artillery, and ground impact of highly-explosive warheads, is also a significant fraction of this overall noise environment. The 46th Test Wing at Eglin AFB routinely tests air-to-air and air-to-ground weapons, static detonation of ordnance or explosives, and firing performance of large caliber guns. Eglin AFB personnel are also involved in a wide range of readiness training operations.

Noise resulting from these testing and training activities has generated complaints from the local communities surrounding the base. The severity of the complaints varies, with the most serious being reports of sleep disruption or structural damage (i.e., broken windows, cracked plaster). Hazards to humans associated with high noise levels are addressed through the Eglin AFB test safety review process, but there is no formal procedure currently in place to assess the impacts of noise on local communities or resident domestic animal or wildlife populations.

The base is in the process, as part of its Range Environmental Planning Initiative, of developing a Noise Management Plan to provide these processes. As part of that plan, the base has identified sensitive receptors (schools, hospitals, etc.), and residential areas that generate a high percentage of the noise complaints received and categorized these on the basis of the type of complaint (complaints only versus structural impacts). Most complaints are generated by subsonic aircraft operations. About 25 percent are caused by impulsive events (SAIC, December, 2001).

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3.5 Biological Resources

This subchapter presents an overview of the biological communities that could be affected by East Coast testing of TLAMs, and the interactions between these communities and their physical environment. The discussion of biological resources includes vegetation, wildlife, and special status species that are found on or near the TLAM test launch, cruise, and termination areas. In cases where local data are not available, general data pertaining to the waters of the Atlantic Ocean and Gulf of Mexico off the East Coast of the US are summarized.

3.5.1 Regulatory Considerations

Potential biological resource constraints are addressed through the federal laws and associated regulations described below.

3.5.1.1 Endangered Species Act

The Endangered Species Act of 1973 (ESA) (16 USC Part 1531 *et* seq.) and subsequent amendments provide for the conservation of threatened and endangered species and their habitats. The law directs that all federal agencies and departments use their authority to preserve endangered and threatened species under guidance from the ESA. The ESA requires that the US Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) issue a permit prior to actions that would result in taking (harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or attempting to engage in any such conduct) of a federally-listed endangered or threatened species.

An endangered species is any species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Protection under ESA also extends to those species proposed for listing as threatened or endangered, as well as those that are candidates for listing by the USFWS or NMFS.

Federal agencies are required under Section 7 of the ESA to consult with the USFWS and/or NMFS prior to undertaking actions that may affect endangered or threatened species. Such consultations may require the federal agency to prepare a biological assessment. After review of the biological assessment, USFWS or NMFS issues a biological opinion stating whether actions of the federal agency may jeopardize the continued existence of any threatened or endangered species and, if so, reasonable and prudent alternatives to avoid such impact.

3.5.1.2 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) (16 USC Part 1361 *et seq.*) was passed by Congress in 1972. The Act makes it illegal for anyone to take any and all species of marine mammals. The MMPA also makes it illegal to import marine mammals or related products to the US. Exceptions to the MMPA include subsistence hunting and incidental takes by commercial fishermen.

The term ''take'' as defined by the MMPA means to harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal. According to the National Defense Authorization Act, which amended the MMPA in November 2003, in the case of a military readiness activity (as defined in section 315(f) of Public Law 107-314; 16 U.S.C. 703 note) or a scientific research activity conducted by or on behalf of the Federal Government consistent with section 104(c)(3), the term "harassment" means:

> (i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild; or
>
> (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered.

Two federal agencies are in charge of administering the MMPA. The NMFS, under the Department of Commerce, has jurisdiction over whales, dolphins, sea lions, and seals; the USFWS, under the Department of Interior, has jurisdiction over manatees, polar bears, sea otters, and walrus.

3.5.1.3 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 USC 1801) establishes US management authority over all fishing within the exclusive economic zone (EEZ); all anadromous and catadromous fishes throughout their migratory range; and all fish on the continental shelf. Additionally, the Magnuson-Stevens Act called for the establishment of eight regional fishery management councils to be responsible for the preparation of fishery management plans (FMPs) to achieve optimum yields from US fisheries in their regions.

On January 17, 2002, NMFS published in the *Federal Register* a final rule to implement the essential fish habitat (EFH) provisions of the Magnuson-Stevens Act; the final rule was effective on February 19, 2002. The purpose of this rule is to establish guidelines to assist the fishery management councils and the Secretary of Commerce in the description and identification of EFH in FMPs, including identification of adverse impacts from both fishing and non-fishing activities on EFH and identification of actions required to conserve and enhance EFH. The regulations also detail procedures that the Secretary (acting through NMFS) will use to coordinate, consult, or provide recommendations on federal and state activities that may adversely affect EFH. The intended effect of the rule is to promote the protection, conservation, and enhancement of EFH.

EFH is defined in the Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The definition for EFH may include habitat for an individual species or an assemblage of species, whichever is appropriate within each FMP.

3.5.1.4 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC Part 668) specifically prohibits the taking of bald and golden eagles or any part, nest, or egg of these species.

3.5.2 Gulf of Mexico Special-use Airspaces

3.5.2.1 Vegetation

Subtidal regions along the west coast of Florida support a diverse marine flora that consists of both algae and seagrasses. The rocky littoral zone is marked by blue-green algae, such as *Microcoleus* and *Calothrix* species, while the lower littoral zone is characterized by filamentous turf algae, such as *Bryopsis, Ceramium, Chaetomorpha, Bostrychia, Acanthophora,* and *Hypnea* species (Dawes, 1974, in: USAF, 1995b).

Seagrasses are marine angiosperms (flowering plants) that occur in estuaries, lagoons, and shallow open shelves off the coast of Florida. Florida's west coast has six seagrass species: turtle grass, manatee grass, shoal grass, widgeon grass, star grass, and a less common species confined to deeper waters (Dawes, 1974, 1987, in: USAF, 1995b). Two major offshore seagrass systems occur along the west coast of Florida (Jones et al., 1985, in: USAF, 1995b). The more northern area east and south of Cape San Blas consists primarily of turtle grass, manatee grass, and shoal grass, with star grass and widgeon grass also present. The southern seagrass area extends out along the Florida Keys and is almost entirely composed of turtle and manatee grasses.

3.5.2.2 Wildlife

The dominant marine life found in the Gulf of Mexico off the coast of Florida are shellfish and finfish, turtles, birds, and mammals. Commercially important shellfish within coastal areas of the Gulf of Mexico include penaeid shrimp, blue crabs, and bay scallops within seagrass beds; stone crabs and gastropods within oyster bar areas; and white and pink shrimp over shelf areas (USAF, 1995b).

Fish species brought in by charter sport fishing boats off Eglin AFB's coastline include king mackerel, Spanish mackerel, bluefish, blue runner, little tunny, Atlantic bonito, and dolphin fish (Wolfe et al., 1988, in: USAF, 1995b). The open-ocean waters near shore areas along the Gulf, rock outcroppings, and hard bottom areas are commercially important areas that support species such as spotted sea trout, sea bass, and snapper. Commercially important nearshore species include sand seatrout, spotted seatrout, spot, croaker, striped mullet, and Gulf menhaden (Livingston, 1991, in: USAF, 1995b). Additionally, associated with rock outcroppings and hard bottom areas of the Florida shelf are numerous commercially-targeted fishes: grouper, sea bass, tilefish, jack, snapper, and porgy. Commercially important fish species in open-ocean waters of the Gulf include king mackerel, Spanish mackerel, cobia, little tunny, and bluefish (Jones et al., 1985, in: USAF, 1995b). Designated fishing and harvesting areas are regulated by the NMFS and the Florida Fish and Wildlife Conservation Commission.

Sea turtles are marine reptiles that spend the majority of their lives at sea but depend on beaches for nesting sites. The following five species of sea turtles are found in the Gulf of Mexico:

- Leatherback turtle (*Dermochelys coriacea*).
- Loggerhead turtle (*Caretta caretta*).
- Green turtle (*Chelonia mydas*).
- Atlantic or Kemp's ridley (*Lepidochelys kempi*).
- Hawksbill turtles (*Eretmochelys imbricata*).

All five are protected by both federal and Florida laws and are addressed below as threatened or endangered species. Leatherback turtles are considered the most pelagic of the sea turtles (Marquez, 1990, in: Southern Division, NAVFACENGCOM, December 1999) and are the most abundant turtle species on the continental slope in the northern Gulf of Mexico (Hansen et al., 1996, in: Southern Division, NAVFACENGCOM, December 1999).

Seabirds are birds whose normal habitat and food source is the sea, whether they mainly utilize coastal waters (near shore), offshore waters (continental shelf), or pelagic waters (open sea) (Harrison, 1983, in: Southern Division, NAVFACENGCOM, December 1999). A variety of marine birds, such as gulls, petrels, and boobies, feed offshore mainly near the continental slope's highly productive upwellings, but may return to nest and roost on shore (Minerals Management Service, 1986 in: USAF, 1995b). Hundreds of bird species migrate along the Florida coastline every year. The Florida beaches along the Gulf of Mexico serve an important function as nesting or overwintering grounds for many common and sensitive bird species.

Twenty-nine species of marine mammals have been reported to occur in or migrate through the Gulf of Mexico region (Department of the Navy [DoN], January 2003). Many of these are listed as threatened or endangered. Relatively common coastal species include the bottlenose dolphin, spotted dolphin, and striped dolphin.

In June 1994, NMFS completed a three-year study of the distribution and abundance of cetaceans in the deeper areas – 330- to 6,560-ft (100- to 2,000-m) depths – in the northern Gulf of Mexico (Evans and Davis, 1998). Based on visual surveys, the researchers determined that the overall minimum number of cetaceans in the study area was 19,128. Seventeen cetacean species were identified during eight aerial surveys (Evans and Davis, 1998). Sperm whales were the most commonly recorded species, accounting for 56 percent of identified contacts. The following five species comprised 71 percent of the sightings in which species were identified, and each was sighted 20 or more times (Evans and Davis, 1998):

- Bottlenose dolphin.
- Pantropical dolphin.
- Risso's dolphin.
- Pygmy/dwarf sperm whale.
- Sperm whale.

3.5.2.3 Essential Fish Habitat

The Gulf of Mexico Fishery Management Council (GMFMC) manages the living marine resources within the EEZ in the Gulf of Mexico. Seven FMPs – for shrimp, red drum, reef fish, coastal migratory pelagic resources (mackerels), stone crab, spiny lobster, and coral and coral reefs – address more than 450 species managed by the GMFMC, with about 400 species contained in the coral and coral reefs plan.

In October 1998, the GMFMC developed a single generic EFH amendment to all seven Gulf of Mexico FMPs (GMFMC, 1998). The amendment identifies and describes EFH based on areas where various life stages of 26 selected managed species and the coral complex commonly occur, as determined from species distribution maps and habitat association tables. According to the GMFMC (1998), the selected species account for about a third of the species under the council's management, are the more important species in terms of commercial and recreational harvest and are considered to be ecologically representative of the remaining species within their respective fishery management units.

In February 1999, NMFS approved the EFH designations for the 26 selected managed species but found that the generic amendment did not consider and assess all managed species. The GMFMC will address EFH for the remaining managed species in future FMP amendments, as NMFS gathers the requisite information and provides it to the council (GMFMC, 1998).

The Gulf of Mexico EWTAs and warning areas include EFH for several shrimp species, red drum, snappers, groupers, amberjack, tilefish, dolphin, cobia, mackerels, stone crab, and spiny lobster (GMFMC, 1998). Additionally, numerous highly migratory pelagic species, including several billfish and tuna, swordfish, and sharks, are covered under FMPs.

The Gulf of Mexico generic amendment defines a Gulf-wide EFH – comprising estuarine and marine components – as everywhere that the managed species commonly occur (GMFMC, 1998). Thus, all of the estuarine systems and all of the EEZ of the Gulf of Mexico are considered EFH under the GMFMC's jurisdiction. The council defines estuarine and marine EFHs as follows (GMFMC, 1998; NMFS, 1999):

- **Estuarine EFH** – EFH is all waters and substrates (mud, sand, shell, rock, and associated biological communities) within the estuarine boundaries, including the subtidal vegetation (sea grasses and algae) and adjacent tidal vegetation (marshes and mangroves). Estuarine EFH comprises estuarine emergent wetlands; mangrove wetlands; submerged aquatic vegetation; algal flats; mud, sand, shell, and rock substrates; and the estuarine water column.

- **Marine EFH** – EFH is all waters and substrates within the EEZ seaward of the estuarine EFH boundary. Marine EFH comprises the marine water column, vegetated bottoms, non-vegetated bottoms, live bottoms, coral reefs, artificial reefs, geologic features, and continental shelf features.

Live bottom EFH, including coral and coral reef, is associated with the Gulf of Mexico EWTAs and warning areas. These habitats contain biological assemblages consisting of sessile

invertebrates – such as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans, seagrasses, and corals – living upon and attached to naturally-occurring hard or rock formations favoring the accumulation of turtles and fish (GMFMC, 1998). Live bottoms are scattered across the shallow waters of the west Florida shelf and in restricted regions of the rest of the Gulf of Mexico. The Florida Middle Ground – 86 nmi (160 km) west-northwest of Tampa and within the EWTAs – is probably the best known and most biologically developed of these areas. Figure 3.1-1 shows the Florida Middle Ground and other sensitive habitats along the TLAM flight test routes.

3.5.2.4 Threatened and Endangered Species

Eighteen protected animal species have been identified as possibly being present in waters below the Eglin AFB EWTAs (USAF, 1995b). As the Eglin AFB water areas comprise most of the subject Gulf of Mexico special-use airspaces, these species are assumed to be representative of the protected species present in this part of the Gulf of Mexico (including waters offshore of Alabama as well as Florida). Table 3.5-1 lists the protected species identified as possibly being present.

Two protected fish species, the Gulf sturgeon (*Acipenser oxyrhynchus desotoi*) and the saltmarsh topminnow (*Fundulus jenkinsi*), are found in the estuaries, salt marshes, and rivers adjoining the Gulf of Mexico. Four protected bird species are known to utilize coastal environments within the Eglin AFB EWTAs. As mentioned above, all five species of sea turtles found in the Gulf of Mexico are protected by both federal and Florida laws. Seven marine mammal species occur in the Gulf as well. Of the six federally-endangered whales that have been sighted in the Gulf of Mexico, only the finback whale (*Balaenoptera physalus*) and the sperm whale (*Physeter macrocephalus*) have a reasonable chance of occurring with regularity below the Eglin AFB EWTAs. The other four species – North Atlantic right whale (*Eubalaena glacialis*), sei whale (*Balaenoptera borealis*), blue whale (*Balaenoptera musculus*), and humpback whale (*Megaptera novaeangliae*) – are only incidental to the area; federally- and state-endangered whales typically occur off the continental shelf in the Gulf of Mexico. The West Indian manatee (*Trichechus manatus*) is found up to a few miles off the Florida Gulf coast.

Table 3.5-1
Threatened and Endangered Species That May Occur in the Gulf of Mexico Special-use Airspaces

Common Name	Scientific Name	Status	
		Federal	Florida
Fish			
Gulf sturgeon	*Acipenser oxyrhynchus desotoi*	T	SSC
Saltmarsh topminnow	*Fundulus jenkinsi*	NL	SSC
Turtles			
Leatherback turtle	*Dermochelys coriacea*	E	E
Loggerhead turtle	*Caretta caretta*	T	T
Green turtle	*Chelonia mydas*	T, EB	E
Atlantic or Kemp's ridley	*Lepidochelys kempi*	E	E
Hawksbill turtles	*Eretmochelys imbricata*	E	E
Birds			
Snowy plover	*Charadrius alexandrinus*	C	T
Piping plover	*Charadrius melodus*	T	T
Arctic peregrine falcon	*Falco peregrinus tundrius*	C	E
Bald eagle	*Haliaeetus leucocephalus*	T, PD	T
Mammals			
Sei whale	*Balaenoptera borealis*	E	E
Finback whale	*Balaenoptera physalus*	E	E
Blue whale	*Balaenoptera musculus*	E	NL
North Atlantic right whale	*Eubalaena glacialis*	E	E
Humback whale	*Megaptera novaeangliae*	E	E
Sperm whale	*Physeter catodon*	E	E
West Indian manatee	*Trichechus manatus*	E	E

Notes:
C – Candidate
E – Endangered
EB – Endangered breeding population
NL – Not listed
PD – Proposed delisting
SSC – Species of special concern
T – Threatened

Sources:
USAF, 1995b; USFWS, November, 2000, DoN, January 2003, Florida Fish and Wildlife Conservation Commission, August 1997.

3.5.3 Atlantic Ocean Special-use Airspaces

3.5.3.1 Vegetation

Two pelagic brown algae, *Sargassum natans* and *S. fluitans*, form a dynamic structural habitat within warm waters of the western North Atlantic. Most pelagic *Sargassum* circulates between 20° N and 40° N latitudes and 30° W longitude, and the western edge of the Florida Current/Gulf Stream. Large quantities of *Sargassum* frequently occur on the continental shelf off the southeastern US. Depending on prevailing surface currents, this material may remain on the shelf for extended periods.

3.5.3.2 Wildlife

Pelagic sharks occurring in offshore waters off the Atlantic coast of Florida include makos, threshers, oceanic whitetip, and blue (Southern Division, NAVFACENGCOM, December 1999). Bony fishes include highly migratory species such as dolphin fish, blue marlin, white marlin, sailfish, swordfish, tunas, and wahoo. In general, oceanic pelagic species associate with the western edge of the Gulf Stream and travel near this edge as they migrate through the area.

Spanish mackerel, king mackerel, little tunny, jacks, requiem sharks, and cobia represent the larger predatory members of the coastal pelagic group found in Atlantic waters off the Florida coast (Southern Division, NAVFACENGCOM, December 1999). Smaller coastal pelagic fish include Atlantic menhaden, round scad, dwarf herring, butterfish, and chub mackerel.

The five species of sea turtles – leatherback, loggerhead, green, Atlantic or Kemp's ridley, and hawksbill turtles – identified as occurring in the Gulf of Mexico special-use airspaces also occur in the Atlantic Ocean off the coast of Florida.

Green, hawksbill, and Kemp's ridley turtles are typically inshore species that are unlikely to be found in deeper waters (Southern Division, NAVFACENGCOM, December 1999). However, because of their pelagic distribution, leatherback and loggerhead turtles are likely to occur in locations further from shore. Surveys along the Atlantic coast that have extended into deep water indicate that adult loggerhead turtles are more abundant than leatherbacks and that both species are more abundant over the continental shelf (Winn, 1982; Fritts et al., 1983; Thompson and Huang, 1993, in: Southern Division, NAVFACENGCOM, December 1999). Therefore, loggerhead turtles are expected to be the most common adult turtles in deeper waters in the Atlantic Ocean off Florida's coast.

All five turtle species also could be present offshore as hatchlings or juveniles associated with *Sargassum* (Southern Division, NAVFACENGCOM, December 1999). *Sargassum* is found often along convergence zones such as the western edge of the Gulf Stream, and it plays a vital role in the early stages of life for green, hawksbill, Kemp's ridley, and loggerhead turtles. Once hatchlings reach the ocean from their nesting beach, they swim out to the floating weed mats. The floating mats provide food and cover, helping to increase their chance of survival.

A variety of seabirds may occur in offshore waters of the Atlantic Ocean off the coast of Florida. Seabird densities over the open ocean are typically low--for example, less than ten birds per square kilometer (Powers, 1987, in: Southern Division, NAVFACENGCOM, December). Other birds, such as waterfowl, marsh birds, and shorebirds, occasionally may be present over open ocean.

As many as 29 species of marine mammals, including seven mysticetes (baleen whales) and 22 odontocetes (toothed whales), may occur in the Atlantic Ocean off the coast of Florida (Southern Division, NAVFACENGCOM, December 1999).

3.5.3.3 Essential Fish Habitat

The South Atlantic Fishery Management Council (SAFMC) is responsible for the conservation and management of fish stocks within the EEZ of the Atlantic off the coasts of North Carolina,

South Carolina, Georgia and eastern Florida to Key West. Those areas adjacent to Florida have been described in detail in the *Shrimp; Red Drum; Snapper-Grouper; Coastal Migratory Pelagics; Golden Crab; Spiny Lobster; Coral, Coral Reefs, and Live/Hard Bottom Habitat;* and *Sargassum Fishery Management Plans* (SAFMC, October 1998b). These plans cover over 40 species managed by the SAFMC.

The SAFMC published their final EFH plan (SAFMC, October 1998b) in the *Federal Register* on March 4, 1999, and NMFS approved the plan in June 1999. This plan describes the EFHs of the south Atlantic region and their distributions. The Atlantic Ocean warning areas include EFH for several penaeid and deepwater shrimp species, red drum, groupers, tilefish, dolphin, cobia, mackerels, golden crab, and spiny lobster. As for the Gulf of Mexico special-use airspaces, numerous highly migratory pelagic species, including several billfish, tuna, swordfish, and sharks, also are covered under FMPs.

According to the SAFMC (October 1998b), the structural habitats – estuarine, palustrine, coral and live/hard bottom, artificial reefs, and *Sargassum* – of the south Atlantic region all are essential to the functioning of a healthy ecosystem in the region. EFHs in the south Atlantic region comprise inshore estuarine habitats and adjacent offshore marine habitats. The SAFMC (October 1998b) defines the estuarine/inshore EFH and the marine/offshore EFH as follows:

- **Estuarine/Inshore EFH** – EFH is estuarine emergent wetlands (salt marsh and brackish marsh), estuarine scrub and shrub wetlands (mangroves), submerged aquatic vegetation, oyster reefs and shell banks, intertidal flats, palustrine emergent and forested (freshwater) wetlands, and the estuarine water column.

- **Marine/Offshore EFH** – EFH is live/hard bottom, coral and coral reefs, artificial/manmade reefs, pelagic *Sargassum*, and water column habitat. *These habitats are likely to occur both within and beyond territorial waters.*

There are two specific marine/offshore EFHs that are likely to be associated with the Atlantic Ocean warning areas, as follows:

- **Live/Hard Bottom Habitat** – Live/hard bottom habitat is scattered irregularly over the continental shelf. This habitat comprises zones of highly-concentrated invertebrate and algal growth, usually in association with marked deviations in relief that support substantial fish assemblages (SAFMC, October 1998b). The extent and distribution of productive live bottom habitat on the continental shelf north of Cape Canaveral is unknown (SAFMC, October 1998a). The live bottom areas are EFH for warm-temperate and tropical species of snappers, groupers, and associated fishes (SAFMC, October 1998b). *These habitats occur both within territorial and non-territorial waters.*

- ***Sargassum* Habitat** – Two pelagic brown algae, *Sargassum natans* and *S. fluitans*, form a dynamic structural habitat within warm waters of the western North Atlantic. Most pelagic *Sargassum* circulates between 20° N and 40° N latitudes and 30° W longitude, and the western edge of the Florida Current/Gulf Stream. Large quantities of *Sargassum* frequently occur on the continental shelf off the southeastern US. Depending on prevailing surface currents, this material may remain on the shelf for extended periods.

Sargassum may form large, irregular mats during calm conditions or be scattered in small clumps.

Pelagic *Sargassum* is considered EFH because it provides protection, feeding opportunity, and use as a spawning substrate to a variety of fish species (SAFMC, October 1998b). In addition to over 100 species of fishes collected or observed associated with *Sargassum*, the habitat supports a diverse assemblage of other marine organisms, including fungi, micro- and macro-epiphytes, invertebrates, sea turtles, and marine birds. The presence of this habitat within the Atlantic Ocean warning areas is transient and dependent on prevailing surface currents. *These habitats occur both within territorial and non-territorial waters.*

In addition, coral and coral reef EFH may occur in the Atlantic Ocean warning areas, both *within territorial and non-territorial waters.* Coral reef communities and solitary corals exist throughout the south Atlantic region, including nearshore environments, *intermediate shelf zones, and continental slopes and canyons (SAFMC, 1998b).* Corals may dominate a habitat, be a significant component, or be among a community characterized by other fauna. EFH for corals (stony corals, octocorals, and black corals) and coral communities incorporate habitat for over 200 species (SAFMC, October 1998b).

3.5.3.4 Threatened and Endangered Species

Table 3.5-2 lists the protected species identified as possibly occurring in the Atlantic Ocean off the coast of Florida. Five protected bird species are known to utilize coastal environments along the Atlantic coast of Florida. Five sea turtles *occur within territorial and non-territorial waters* in the area; all five are protected by both federal and Florida laws.

Six of the cetaceans potentially occurring *within territorial and non-territorial waters* in the Atlantic Ocean off the coast of Florida are listed as endangered under the ESA. These are the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), North Atlantic right whale (*Eubalaena glacialis*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*). In addition to their endangered status, all of these are classified as strategic stocks by NMFS.

The sperm whale is the cetacean most likely to occur in *both territorial and non-territorial waters*, although infrequently or at low densities (in: Southern Division, NAVFACENGCOM, December 1999). *Fritts et al. (1983, in: Southern Division, NAVFACENGCOM, December 1999) observed sperm whales off eastern Florida during all seasons; all but one were observed beyond the 656-ft (200-m) isobath.* North Atlantic right whales are of special concern because of their critically-endangered status – only about 300 individuals remain (Knowlton et al., 1994, in: Southern Division, NAVFACENGCOM, December 1999). *Critical habitat for the North Atlantic right whale is located off northeastern Florida. North Atlantic right whales generally occur off Florida from November or early December to April, with peak abundance between January and March (Kraus et al., 1993, in: Southern Division, NAVFACENGCOM, December 1999).*

Table 3.5-2
Threatened and Endangered Species that May Occur in the Atlantic Special-use Airspaces

Common Name	Scientific Name	Status	
		Federal	Florida
Turtles			
Loggerhead turtle	*Caretta caretta*	T	T
Green turtle	*Chelonia mydas*	T, EB	E
Leatherback turtle	*Dermochelys coriacea*	E	E
Hawksbill turtle	*Eretmochelys imbricata*	E	E
Atlantic or Kemp's ridley turtle	*Lepidochelys kempi*	E	E
Birds			
Snowy plover	*Charadrius alexandrinus*	C	T
Piping plover	*Charadrius melodus*	T	T
Arctic peregrine falcon	*Falco peregrinus tundrius*	C	E
Bald eagle	*Haliaeetus leucocephalus*	T, PD	T
Roseate tern	*Sterna dougallii*	T	T
Mammals			
Sei whale	*Balaenoptera borealis*	E	E
Finback whale	*Balaenoptera physalus*	E	E
North Atlantic right whale	*Eubalaena glacialis*	E	E
Humback whale	*Megaptera novaeangliae*	E	E
Sperm whale	*Physeter catodon*	E	E
Blue whale	*Balaenoptera musculus*	E	E
West Indian manatee	*Trichechus manatus*	E	E

Notes:
C – Candidate
E – Endangered
EB – Endangered breeding population
PD – Proposed delisting
SSC – Species of special concern
T – Threatened

Source:
USAF, 1995b; USFWS, November 2000.

One endangered sirenian, the West Indian manatee (*Trichechus manatus*), occurs in Florida. The manatee is a coastal species.

As stated above, all five species of sea turtles that occur in the Atlantic Ocean off the coast of Florida are protected under the ESA and Florida law.

3.5.4 Florida IRs

3.5.4.1 IR-015

Vegetation

IR-015 crosses the low to gently rolling coastal topography of the Florida panhandle. At the eastern landfall, the IR crosses the Apalachicola National Forest, which is characterized by large tracts of lowland swamps covered by cypress, oaks, and magnolias. Mesic (moderate moisture) flatwoods dominate in upland areas and are characterized as having open canopy of widely-

spaced pine trees with little or no understory but a dense ground cover of herbs and shrubs. Mesic flatwoods are found on relatively flat, moderately-to-poorly-drained terrain. The most common plant association is longleaf pine-wiregrass-runner oak followed by slash pine-gallberry-saw palmetto with an understory of St. Johnswort, dwarf huckleberry, fetterbush, dwarf wax myrtle, stagger bush, blueberry, gopher apple, tar flower, bog buttons, blackroot, falso foxglove, white-topped aster, yellow-eyed grass, and cutthroat grass.

Also common on drier sites is the sandhill plant community, characterized as a forest of widely-spaced pine trees with a sparse understory of deciduous oaks and a fairly dense cover of grasses and herbs on rolling hills of sand. The most typical associations are dominated by longleaf pine, turkey oak, and wiregrass. Other typical plants include bluejack oak, sand post oak, sparkleberry, persimmon, winged sumac, pinewoods dropseed, Indian grass, wild buckwheat, queen's delight, yellow foxglove, bracken fern, runner oak, goats rue, partridge pea, milk pea, dollarweeds, wild indigo, gopher apple, and golden aster.

West of the Apalachicola National Forest, the land continues to be characterized by a great variety of moist-to-wet plant communities interspersed with mesic flatwoods, sandhills, and some areas of upland forest, as described in the *Guide to the Natural Communities of Florida* (Florida Natural Areas Inventory, 1990). Upland communities include mesic flatwoods (described above), bluffs (sparsely vegetated with weedy species), slope forest (moist, closed canopy of upland hardwoods such as black walnut, basswood, white oak, American beech, laurel oak), sandhill (dry, widely-spaced longleaf pine with understory of turkey oak), scrubby flatwoods (dry, scattered longleaf pine, slash pine, sand live oak, Chapman's oak, myrtle oak with sparse, shrubby understory), and upland hardwood forest (closed-canopy, moist hardwood forest on rolling hills typified by southern magnolia, pignut hickory, sweetgum, Florida maple, and oaks).

Table 3.5-3 indicates the great diversity of wetland plant communities found in the counties under IR-015, each with its own typical plant assemblage. Some of these natural communities harbor rare plants and animals. An example is the seepage slope, which is a shrub thicket or boggy meadow on or at the base of a slope that usually harbors a number of threatened or endangered endemic orchids, showy wildflowers, and insectivorous plants.

Table 3.5-3
Wetland Plant Communities Found in Counties under IR-015

Name of Natural Community	Characteristic Species
Alluvial Stream	Water lilies, spatterdock, white pickerel weed, cattails, and along stream margins, willow, cottonwood, river birch
Aquatic Cave	Fungi
Blackwater Stream	Golden club, smartweed, sedges, grasses
Baygall	Densely packed, tall broadleaf evergreens including sweetbay, red bay, loblolly bay, dahoon holly, Atlantic white cedar, fetterbush
Coastal Dune Lake	Edged with rushes, sedges, marsh pennywrot, cattail, sawgrass, water lilies
Clastic Upland Lake	May be edged with buttonbush, Virginia willow, wax myrtle; or with sedges, grasses, rushes; or with bald cypress, water hickory, water oak, laurel oak
Sandhill Upland Lake	May be edged with dense shrubs or hydrophytic grasses and herbs; panicums, rushes, bladderwort, water lilies, sawgrass, pickerelweed
Depression Marsh	Isolated, St. John's wort, spikerush, yellow-eyed grass, chain fern, willows
Sinkhole	Mosses, liverworts, ferns on sides; southern magnolia, sweetgum, wax myrtle
Sinkhole Lake	American cupscale, bog moss, smartweed, rushes, cattails, bladderwort
Spring-run Stream	Tape grass, wild rice, giant cutgrass, arrowheads, southern naiads, pondweeds
Seepage Slope	Shrub thicket of slash, pond, and longleaf pine plus titi, fetterbush, myrtle-leaved holly, orchids, ferns, and an array of insectivorous plants
Seepage Stream	Spatterdocks, golden club, spikerush, pondweeds
Slough	Pond apple, Carolina ash, fragrant waterlily, floating aquatics, water elm, ogeechee tupelo
Swamp Lake	Fragrant water lily, banana lily, American lotus, spatterdock, duckweed
Dome Swamp	Forested with pond cypress, swamp tupelo, slash pine, red maple, dahoon holly
Bottomland Forest	Closed canopy of live oak, water oak, red maple, sweet gum, loblolly pine, white cedar, cabbage palm, diamond-leaf oak, southern magnolia
Floodplain Forest	Overcup oak, water hickory, diamondleaf oak, swamp chestnut oak, bluestem palmetto, willow oak, green ash, Florida elm, sweetgum
Basin Swamp	Blackgum, cypress, slash pine, red maple, swamp redbay, sweetbay magnolia
Basin Marsh	Herbaceous or shrubby with common reed, panicum, cutgrass, southern watergrass, pennywort, Spanish needle, coastal plain willow, saltbush, elderberry
Bog	Dense evergreen forests on sphagnum moss dominated by titi, fetterbush, large gallberry, loblolly bay, redbay, sweetbay
Marine Tidal Marsh	Black needlerush, smooth cordgrass, saltgrass, saltmarsh cordgrass, gulf cordgrass, soft rush
Estuarine Tidal Marsh	Same as marine tidal marsh plus sawgrass
Maritime Hammock	Live oak, cabbage palm, redbay, American holly, southern magnolia, red cedar
Hydric Hammock	Well-developed hardwood and cabbage palm forest with understory dominated by palms and ferns
Wet Flatwoods	Open canopy of pond pine, slash pine, cabbage palm, sweetbay, spikerush, beakrush, sedges
Wet Prairie	Treeless plain with wiregrass, toothache grass, maidencane, spikerush, beakrush
Source: Florida Natural Areas Inventory, 1990.	

Wildlife

Typical animals found in the mesic flatwoods that predominate along IR-015 include oak toad, little grass frog, narrowmouth toad, black racer, red rat snake, southeastern kestrel, brown-headed nuthatch, pine warbler, Bachman's sparrow, cotton rat, cotton mouse, black bear, raccoon, grey fox, bobcat, and white-tailed deer. Moist slope forests and upland hardwood forests are home to a broad array of amphibians and reptiles plus turkey, woodcock, grey squirrel, and an array of birds typical of the Piedmont and southern Appalachian hardwood forests.

Forested wetlands, such as bottomland forests, floodplain forests, and wet flatwoods typically are home to many salamander, frog, snake and skink species. The more common salamanders include marble, mole, dwarf, three-lined, two-toed amphiuma, Alabama waterdog, rusty mud, and slimy. Common snakes in wooded swamps include yellow rat snake, diamondback rattlesnake, pygmy rattlesnake, cottonmouth, eastern king snake, gray rat snake, mud snake, rainbow snake, red-bellied watersnake, brown water snake, glossy crawfish snake, black swamp snake, and ringneck snake. A diverse array of birds occur, typified by common song birds such as cardinal, warblers, vireos, flycatchers, yellow-crowned night heron, swallowtail kite, Mississippi kite, red-shouldered hawk, bobwhite, wood duck, pileated, hairy and downy woodpeckers, screech, great horned and barred owls. The mammals common to the mesic flatwoods also occur in the wetter forests plus opossum, beaver, mink, river otter, marsh rabbit, cottontail rabbit, striped skunk, wood rat, rice rat, golden mouse, and flying squirrel (Florida Natural Areas Inventory, 1990).

Wildlife common to treeless wetlands include a great variety of frog, salamander, and snake species; alligators and turtles; great blue heron, great egret, snowy egret, little blue heron, tricolored heron, bald eagle, northern harrier, killdeer, marsh wren, flycatchers, warblers, and red-winged blackbird; marsh rabbit, opossum, shrews, and southern mink (Florida Natural Areas Inventory, 1990).

Bird rookeries, most typically of herons and egrets, occur in trees near wetlands in most of the counties under IR-015 but not necessarily in the vicinity of the IR. Migrating birds rely on panhandle forests and wetlands for food and shelter following trans-Gulf migrations (Florida Natural Areas Inventory, 1990).

The many freshwater features along the IR support a great diversity of fish and aquatic reptile species. Typical upland lake and stream species include Florida gar, bowfin, threadfin shad, chain pickerel, golden shiner, ironcolor shiner, redeye club, yellow bullhead, brown bullhead, pirate perch, golden topminnow, lined topminnow, pygmy killifish, mosquitofish, least killifish, brook silverside, flier, Okefenokee pygmy sunfish, bluespotted sunfish, warmouth, bluegill, redear sunfinsh, largemouth bass, black crappie, and swamp darter. Typical lowland stream species include eel, gizzard shad, speckled chub, madtom, pirate perch, striped bass, redbreast sunfish, warmouth, bluegill, crappie, darter, alligator, snapping turtle, and alligator snapping turtle (Florida Natural Areas Inventory, 1990).

Threatened and Endangered Species

Tables 1 and 2 of Appendix B list the state- and federally-listed threatened and endangered species found in the counties under IR-015, noting the counties in which the plant and animal species have been found. Because the IR only traverses a band through each county, the listed species may not, in fact, be found anywhere near the IR.

3.5.4.2 IR-030/031

Vegetation

The vegetation of this IR, which crosses Walton and Okaloosa counties in Florida and eight Alabama counties, is similar to the vegetation in IR-015. The counties in Alabama crossed by the IR lie in the low-relief, relatively swampy Gulf coastal plain, as do the counties along IR-015. The IR crosses Conecuh National Forest in Alabama which is described as including coastal plain longleaf pine forests, hardwood swamps, bogs with a number of species of insectivorous plants, upland scrub oak forest, winding creeks, and cypress ponds (GORP Website, January 31, 2002). This description also applies to the remainder of the Gulf coastal plain. The wetland plant communities along IR-030/31 are similar to those listed in Table 3.5-3 for IR-015.

Wildlife

The common fish and wildlife of this IR are similar to those described for IR-015.

Threatened and Endangered Species

Tables 3 and 4 of Appendix B list the Florida state-listed threatened and endangered species as well as the federally-listed Florida and Alabama species found in the counties along this IR. The State of Alabama does not maintain a listing of rare, threatened, or endangered species.

3.5.4.3 IR-032/033

Vegetation

After making landfall on the Atlantic Coast at South Ponte Vedra Beach, IR-032/033 crosses the St. Johns River and proceeds to Starke. Low-lying pine forest interspersed with lakes, swamps, alluvial stream valleys, and marshy areas covers the terrain from the South Ponte Vedra Beach to Starke. The predominant plant community on drier sites throughout the IR is mesic flatwoods, the most common plant community in the state. As described for IR-015, this community is typified either by a longleaf pine-wiregrass-runner oak association or a slash pine-gallberry-saw palmetto association. The upland hardwood forests of the panhandle are replaced in this IR by scattered mixed upland forests which include longleaf pine but do not include the more northern species of the upland hardwood forest, such as beech and shortleaf pine (Florida Natural Areas Inventory, 1990). The state parks of O'Leno, River Rise, and Ichetuckness Springs lie under the IR. West of Branford and extending to the Gulf of Mexico, the IR is primarily low-lying wooded swamp.

As is true of IR-015, a great diversity of wetland types occurs along this IR. The wetland plant communities listed in Table 3.5-3 also occur along this IR. Moving from east to west in the IR, the area covered by wetland plant communities increases. The counties of Bradford, Union, Gilchrist, Lafayette, Taylor and Dixie are covered predominantly by bottomland forest, floodplain forest, bog, floodplain swamp, spring-run stream, basin swamp, and blackwater stream plant communities.

Wildlife

Freshwater fish and wildlife found along this IR would be the same as described for IR-015 because the plant communities on which they depend are similar.

Threatened and Endangered Species

Table 5 and 6 of Appendix B list the state- and federally-listed threatened and endangered species found in the counties under IR-032/033, noting the counties in which the plant and animal species have been found. Because the IR only traverses a band through each county, the listed species may not, in fact, be found anywhere near the IR.

3.5.5 Target Areas

Eglin AFB manages biological resources through the *Integrated Natural Resources Management Plan, Eglin Air Force Base, FL, 2002-2006* (INRMP) (USAF, 2002). Among the elements contained in the INRMP are guidelines for biodiversity management, threatened and endangered species management, forest management, fire management, and fish, wildlife, and recreation management. The INRMP divides the conservation resources on Eglin AFB into four broad ecological associations. The intent of this classification system is to combine relatively large, ecologically-similar areas for management purposes. The four broad ecological associations, each characterized by similarities in floral, faunal, and geophysical features, are the sandhills matrix, flatwoods matrix, barrier island matrix, and wetlands/riparian matrix (USAF, 2002). The sandhills matrix also includes some areas of forested test range. The wetlands/riparian matrix is further divided into the riverine aquatic system, depression wetlands, baygalls, floodplain wetlands, and seepage slopes.

3.5.5.1 Vegetation

Eglin AFB's sandhills matrix contains more than 90 percent of the remaining old growth longleaf pine (*Pinus palustris*) forests in the world (USAF, 2002). All of Eglin AFB's old growth longleaf pine stands have been identified, inventoried, mapped, and protected. The sandhills consist of open, savanna-like areas with a moderate to tall canopy of longleaf pine, a sparse midstory of hardwoods, and a diverse groundcover of grasses and shrubs. The sandhills matrix is also associated with scrub, upland pine forest, xeric hammock, and slope forests. Dominant grass species are wiregrass (*Aristida* spp.) and bluestem (*Andropogon* spp.). Other species associated with the sandhills matrix include turkey oak, xerophytic oak, deciduous oak, and high pine. Prescribed burns every three to five years maintain the vegetative composition of the sandhills.

The flatwoods matrix has a canopy of longleaf pine and an understory varying from shrubs to grassland.

Vegetative communities in the barrier island matrix include primary and secondary dunes, interdune swales, maritime forests, and sand pine scrub.

A minimum of 11 different plant community types, as defined by the State Heritage Program, lie within Eglin AFB riparian areas (USAF, 2002). The depression wetlands have woody and/or herbaceous vegetation. The seepage slopes wetlands have the most diverse plant communities.

3.5.5.2 Wildlife

The variety of habitats found on Eglin AFB support a rich diversity of game and non-game wildlife. As of 1995, 559 animal species have been identified (USAF, 1995a). Twenty-two families of herpetofauna are known to be present on Eglin AFB (USAF, 1996). The avifauna is varied, with 53 families being represented. Over 300 bird species, of which approximately 80 are present year-round, have been recorded. Twenty-six species of terrestrial mammals have been collected or sighted. Eglin AFB lies within the range of 18 additional mammalian species, although presence of these species has not been documented. Many invertebrate and fish species are found within streams associated with Eglin AFB's 12 large watersheds.

Eglin AFB has managed its wildlife since 1949; the current wildlife management plan is incorporated into the INRMP (USAF, 2002). In 1991, the Air Force signed a Memorandum of Agreement to participate in USFWS Federal Neotropical Migratory Bird Conservation Program, which promotes and protects neotropical birds (birds that winter in South and central America and come to temperate regions to breed in the summer) and their habitats (USAF, 1995b). Eglin AFB has entered also into a cooperative agreement with USFWS and the Florida Fish and Wildlife Conservation Commission for the protection, development, and management of fish and wildlife resources at Eglin AFB.

The sandhills matrix provides habitat for a wide variety of bird species (USAF, 1995b). Raptors include the screech owl, red-shouldered hawk, and great horned owl, which nest and hunt rodents in these woodlands of the sandhills. The southeastern American kestrel preys on small rodents, reptiles, and insects in clearings or woodland edges. Game birds include wild turkey, wood duck, bobwhite quail, and mourning dove. The sandhill upland lakes provide feeding areas for wading birds. Other indigenous birds include warblers, vireos, red-cockaded woodpecker, pileated woodpecker, white-breasted nuthatch, Bachman's sparrow, and pine siskin. Neotropical migrants occurring on Eglin include the ruby-throated hummingbird, summer tanager, common yellowthroat, blue grosbeak, and great crested flycatcher. Established burrows for the Florida burrowing owl have been found in the open grassland and shrubland of Test Areas B-70, B-75, and C-52N.

A variety of mammals are found in the sandhills matrix, including the white-tailed deer, fox squirrel, gray squirrel, flying squirrel, armadillo, feral pig, raccoon, southern pocket gopher, cotton mouse, oldfield mouse, and eastern cottontail rabbit (USAF, 1995b). Characteristic predators in this matrix include gray fox and bobcat. On occasion the Florida black bear is found here. Reptiles include the gray rat snake, coral snake, six-lined racerunner, eastern fence lizard,

gopher tortoise, box turtle, barking treefrog, central newt, eastern diamondback rattlesnake, eastern coachwhip, southern black racer, eastern box turtle, and the slender glass lizard (USAF, 1995b).

Within the barrier island matrix, the Santa Rosa beach mouse (*Peromycus polionotus leucocephalus*) is a depleted species that occurs in the western and central units of Eglin AFB (USAF, 2002). The population in the western unit is one of the largest and healthiest while the population in the central unit is less stable. It is fossorial, mostly nocturnal, and can be found only in the coastal sand dune ecosystem. The Santa Rosa beach mouse is not currently listed by the state or Federal government but may be considered for listing soon.

3.5.5.3 Threatened and Endangered Species

The varied habitats on Eglin AFB support threatened or endangered species that are protected by the ESA. Species protected under the Florida Endangered Species Act of 1990 are also considered when activities are proposed or planned for Eglin AFB (USAF, 1995b). Table 3.5-5 lists endangered and threatened species of plants located on or within 0.6 mi (one km) of Test Areas B-70, B-75, C-52, and C-72.

Air Force projects that may affect federally-protected species, species proposed for federal listing, and critical habitat for protected species are subject to Section 7 of the ESA prior to irreversible or irretrievable commitment of these resources (USAF, 1995b). Eglin has developed an overall goal within the *Integrated Natural Resources Draft Transitional Plan* (USAF, March 1998a) to continue to protect and maintain populations of native threatened and endangered plant and animal species within the guidelines of ecosystem management. The cooperative agreement between Eglin AFB and both USFWS and the Florida Fish and Wildlife Conservation Commission, mentioned above, pertains to the management of individual species on Eglin AFB, including both federally- and state-listed species.

Table 3.5-4
Threatened and Endangered Species at or near the Eglin AFB Target Areas – Plants

Common Name	Scientific Name	Status		Occurrence on or within 0.6 mi (1 km)			
		Federal	Florida	B-70	B-75	C-52	C-72
Florida wild indigo	*Baptisia calycosa var. villosa*		T		√	√	√
Baltzell's sedge	*Carex baltzellii*		T		√	√	√
Florida anise	*Illicium floridanum*		T	√			
Mountain laurel	*Kalmia latifolia*		T	√			
Bog buttons	*Lachnocaulon digynum*	C				√	
Panhandle lily	*Lilium iridollae*	C	E			√	
Ashe's magnolia	*Magnolia ashei*	C	E	√			
Pyramid magnolia	*Magnolia pyramidata*		E	√			
Naked-stemmed panicgrass	*Panicum nudicaule*	C				√	
Orange azalea	*Rhododendron austrinum*	C	E	√			
Sweet pitcherplant	*Sarracenia rubra*		T			√	
Gulf spike moss	*Selaginella ludoviciana*		GT	√			
Silky camellia	*Stewartia malacodendron*		E	√			
Pineland hoary pea	*Tephrosia mohrii*		T	√	√	√	√
Karst pond yellow-eyed grass	*Xyris longisepala*	C	E	√			

Notes:
C – Candidate
E – Endangered
T – Threatened
GT – Groups of species, not individual species, listed as threatened

Sources:
Florida Fish and Wildlife Conservation Commission, August 1997; USAF, 1995b, March 1998b, June 1999a, September 1999b, September1999c, March 2000; USFWS, November 2000; USAF, 2002.

Table 3.5-5
Threatened and Endangered Species at or near the Eglin AFB Target Areas – Animals

Common Name	Scientific Name	Status		Occurrence on or within 0.6 mi (1 km)			
		Federal	Florida	B-70	B-75	C-52	C-72
Mammals							
Florida black bear	*Ursus americanus floridanus*	C	T	√	√	√	√
Birds							
Florida burrowing owl	*Athene cunicularia*		SSC	√	√	√	
Arctic peregrine falcon	*Falco peregrinus tundrius*	D	E	√			√
Southeastern American kestrel	*Falco sparverius paulus*	C	T	√	√	√	√
Bald eagle	*Haliaeetus leucoephalus*	T, PD	T	√			
Red-cockaded woodpecker	*Picoides borealis*	E	T	√	√	√	√
Reptiles and Amphibians							
Flatwoods salamander	*Ambystoma cingulatum*	T					√
Eastern indigo snake	*Drymarchon corais couperi*	T	T	√	√	√	
Gopher tortoise	*Gopherus polyphemus*	C	SSC	√	√	√	√
Florida pine snake	*Pituophis melanoleucus*	C	SSC	√	√	√	√
Dusky gopher frog	*Rana capito sevosa*	PE	SSC	√	√	√	
Florida bog frog	*Rana okaloosae*		SSC			√	
Fish							
Okaloosa darter	*Ethoestoma okaloosae*	E	E			√	√

Notes:
C – Candidate
D – Delisted
E – Endangered
PD – Proposed delisting
PE – Proposed endangered
SSC – Species of special concern
T – Threatened

Sources:
Florida Fish and Wildlife Conservation Commission, August 1997; USAF, 1995b, March 1998b, June 1999a, September 1999b, September 1999c, March 2000; USFWS, November 2000.

3.6 Cultural Resources

The National Historic Preservation Act (NHPA) of 1966, as amended, directs federal agencies to integrate consideration of historic preservation issues into the early stages of their project planning. Accordingly, under Section 106 of the Act, the head of any federal agency having direct or indirect jurisdiction over a proposed federal or federally-financed undertaking is required, before the expenditure of any federal funds on that undertaking, to consult with the State Historic Preservation Office and to account for the undertaking's effects on any district, site, building, structure, or object that is included or eligible for inclusion in the National Register of Historic Places (NRHP). Eligibility recommendations are generally based on National Register criteria and National Park Service guidelines for architectural integrity. Also relevant are Executive Order 11593, *Protection and Enhancement of the Cultural Environment*; NEPA; and OPNAVINST 5090.1B, *Environmental and Natural Resources*.

The Advisory Council for Historic Preservation's regulations for the implementation of Section 106 of NHPA are laid out in 36 CFR Part 800. Per these regulations, after determining that an action is subject to the Section 106 review process, the responsible agency must first identify the area of potential effect, that is the area within which "an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR 800.16[d]). Once the area of potential effect has been determined, the cultural resources it may contain must be identified.

In addition to land-based archaeological and historic resources, cultural resources can include shipwreck and submerged prehistoric sites, which the Abandoned Shipwreck Act of 1987 recognized as part of the cultural heritage of the US, to be owned, managed, and protected by the states within whose submerged lands they are found. The states are encouraged by the Act to create underwater parks and areas to better protect these underwater resources.

For the action assessed in this EA/OEA, the area of potential effect is non-contiguous and includes:

- Those submerged lands that underlie or are immediately adjacent to the Florida EWTAs, warning areas and IRs that would be used for implementation of the Proposed Action. The area of potential effect for TLAM test flights thus includes nearshore waters, IRs, and target areas.
- The footprints of IRs 030/031, 032/033, and 015.
- Eglin AFB's Test Areas B-70, B-75, C-52, and C-72.

3.6.1 Gulf of Mexico and Atlantic Ocean Special-use Airspaces

Because of Florida's long history, the submerged lands of the state, which extend three mi (4.8 km) into the Atlantic Ocean and three marine leagues (approximately nine mi [14.5 km]) into the Gulf of Mexico, are rich in shipwrecks with high potential archaeological and historic interest.

Warning areas, by definition, overlie international waters. However, parts of the EWTAs, as well as endpoints of the three IRs to be used for TLAM testing in Florida, overlie Florida's submerged lands. Emergency termination areas may also occur within waters overlying state submerged lands.

The Florida Bureau of Archaeological Research (BAR) conducts programs in underwater archaeology that include the establishment of State Underwater Archaeological Preserves (UAP); archaeological surveys; and inventories of submerged sites throughout the state. In particular, the BAR has been working with the Naval Historical Center in Washington, DC, to document and protect sunken US Navy and Confederate ships in the state's waters (US Navy and Confederate Shipwreck Project).

Phase One of this project has compiled more than 300 individual shipwreck records. Phase Two of the project involves further study of some selected sites, as well as some archaeological reconnaissance and fieldwork. Some of this work may lead to the identification of wrecks eligible for listing in the NRHP. An example is the investigation of the USS Alligator, which sunk near Islamorada in the Florida Keys in 1822. The USS Alligator is now lying in the Florida Keys National Marine Sanctuary and is proposed for listing in the NRHP (Florida Department of State Website, January 2002). Thus, any number of yet uninvestigated or unidentified potentially NRHP-eligible shipwrecks may lie in Florida's waters.

Some important shipwreck sites have been designated as UAPs by the Florida BAR. Of these, the Tarpon UAP (off Panama City) lies some distance east of IR-030/031, and the City of Hawkinsville UAP (in the Suwannee River) is some distance south of IR-032/033 (Florida Department of State Website, January 2002).

3.6.2 IRs

A wide range of cultural resources can be found in those parts of Florida and Alabama under the IRs that would be used to implement the Proposed Action. These resources include: archaeological sites that document the pre-European history of those regions; architectural remainders of Florida's Spanish roots; and significant places, structures, and buildings from all periods of the history of the US and individual states.

This section focuses on those resources that are listed in the NRHP. However, any site or structure that is more than 50 years old may be eligible for listing if it meets the criteria of significance and integrity defined by the NRHP and the National Park Service. Not all potentially-eligible resources have been assessed, and not all resources that have been assessed and determined to be eligible for listing have been listed yet. Therefore, in addition to the NRHP-listed resources summarized below, any number of similar but as yet unidentified or unlisted eligible resources may be located within the IR footprints.

3.6.2.1 IR-032/033

IR-032/033 is 20 nmi (23 mi/37 km) wide (ten nmi [11.5mi/18.5 km] on either side of the centerline). It extends east-west across the following Florida counties: Duval, St-Johns, Putnam,

Clay, Bradford, Columbia, Union, Alachua, Gilchrist, Suwannee, Lafayette, Dixie, and Taylor. National Register sites within the IR-032/033 footprint are listed in Table 3.6-1.

Table 3.6-1
National Register-Listed Sites Within or near IR-032/033 (Florida)

County	Sites
St-Johns	28 sites in and near the historic city of St. Augustine, including the Castillo de San Marcos National Monument.
Clay	Green Cove Springs Historic District. Clay County Courthouse (Green Cove Springs). Princess Mound (near Green Cove Springs). St. Margaret's Episcopal Church (Hibernia). Bubba Midden (near Hibernia) Seven sites in Middleburg, including the Middleburg Historic District.
Bradford	Call Street Historic District (Starke). Old Bradford County Courthouse (Starke).
Union	Townsend Building (Lake Butler).
Columbia	Fort White Public School Historic District (Fort White).
Alachua	Newnansville Town Site (near Alachua). High Springs Historic District.
Taylor	Old Perry Post Office (Perry). Old Taylor County Jail (Perry).
Source: Naval Air Test Center, 1991; FREAC Website, accessed January 2002.	

3.6.2.2 IR-015

IR-015 is ten nmi (11.5 mi/18.5 km) wide (five nmi [5.5 mi/9 km] on either side of the centerline). It cuts across nine Florida counties: Wakulla, Leon, Liberty, Gadsden, Calhoun, Bay, Jackson, Washington, and Walton. NRHP-listed sited within the IR-015 footprint are shown in Table 3.6-2.

Table 3.6-2
National Register-Listed Sites within or near IR-015 (Florida)

County	Sites
Wakulla	Old Wakulla County Courthouse (Crawfordville). St. Marks Lighthouse (near St. Marks) Fort San Marcos de Apalache (St. Marks).
Liberty	Torreya State Park-Gregory House (near Bristol). Yon Mound and Village Site (near Bristol).Otis Hare Archaeological Site (Blountstown).
Calhoun	Old Calhoun County Courthouse (Blountstown). Cayson Mound and Village Site (near Blountstown).
Washington	Moss Hill Church (near Vernon).
Walton	Perry L. Biddle House (DeFuniak Springs). Chautauqua Auditorium (DeFuniak Springs). Sun Bright/Sidney Catts House (DeFuniak Springs). DeFuniak Springs Historic District.
Source: Naval Air Test Center, 1991; FREAC Website, accessed January 2002.	

3.6.2.3 IR-030/031

This IR is ten nmi (11.5 mi/18.5 km) wide (five nmi [5.5 mi/nine km] on either side of the centerline). It traverses two Florida counties (Walton and Okaloosa) and eight Alabama counties (Covington, Butler, Conecuh, Monroe, Wilcox, Clarke, Baldwin, and Escambia). NRHP-listed sites within or near IR-030/031 are shown in Table 3.6-3.

Table 3.6-3
National Register-Listed Sites within or near IR-030/031

County[1]	Sites
Covington	Andalusia Commercial Historic District. Avant House (Andalusia). Bank of Andalusia (Andalusia). Central of Georgia Depot (Andalusia). Covington County Courthouse and Jail (Andalusia). First National Bank Building (Andalusia).
Wilcox	Pine Apple Historic District. Hawthorn House (Pine Apple). Oak Hill Historic District. Snow Hill Normal and Industrial Institute (Snow Hill).
Baldwin	Fort Mims Site (near Tensaw). Nelson House (Latham). Latham United Methodist Church (Latham). Montgomery Hill Baptist Church (Tensaw).
Escambia	Brewton Historic Commercial District.

Note: 1. All Alabama counties
Source: Alabama Historical Commission Website, accessed January 2002.

3.6.3 Eglin AFB Test Areas

Eglin AFB is currently in the process of finalizing a Cultural Resources Management Plan. As of the date of this EA/OEA, the draft plan was not available (Shreve, 2004). Further information may become available when the plan is released. Eglin AFB systematically conducts cultural resource surveys in order to comply with NHPA requirements. Therefore, information pertaining to historic and archaeological resources is constantly updated. However, information on the number and location of Eglin AFB's known Areas of Cultural Concern is presently available. Eglin AFB defines Areas of Cultural Concern to be "[National-Register] eligible cultural resources [that] have been identified or have a high probability of being identified" (Shreve, 2004).

Unless otherwise specified, the following describes known Areas of Cultural Concern based on available GIS data (Tucker, 2004).

3.6.3.1 Test Area B-70

There are no known Areas of Concern within B-70.

3.6.3.2 Test Area B-75

B-75 does not contain any known Areas of Cultural Concern.

3.6.3.3 Test Area C-52

There are six Areas of Cultural Concern within Test Area C-52.

3.6.3.4 Test Area C-72

Two Areas of Cultural Concerns are wholly or partially within Test Area C-72.

The six Areas of Cultural Concern on C-52 and the two Areas of Cultural Concern on C-72 are located in relatively undisturbed, vegetated portions of the respective ranges. These areas are not active target locations for tests of the type described in this EA/OEA. The central portion of the C-52 Complex, comprised of C-52A, C-52C and C-52N, is kept clear of vegetation and is maintained for use as a target site. All significant cultural resources are located outside the central target area in the forested portions of the complex. Likewise, the two significant cultural resources on C-72 are in portions of the test area that are not target locations. Since no Areas of Cultural Concern would be targeted during the tests, there would be no anticipated effect to cultural resources. Therefore, Section 106 consultation with the SHPO is not required, as provided by the following programmatic agreement: *Programmatic Agreement between the Air Armament Center, Eglin AFB, the Advisory Council on Historic Preservation, and the Florida State Historic Preservation Officer Regarding the Preservation and Protection of Historical and Archaeological Resources Located at Eglin AFB, FL*, dated February 14, 2003.

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3.7 Water Resources

The study area for the water resources analysis includes the launch sites in the Atlantic Ocean, the Straits of Florida, and the Gulf of Mexico; water features beneath the IRs; and surface water and groundwater at the potential target and emergency termination areas.

3.7.1 Regulatory Considerations

Protection of water resources is addressed by federal laws and regulations as follows.

3.7.1.1 Clean Water Act

The Clean Water Act (CWA) of 1977 (33 USC Section 1344), which amends the Federal Water Pollution Act of 1972, and subsequent amendments were designed to assist in restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. This covers the discharge of pollutants into navigable waters, such as effluents from wastewater treatment management, stormwater discharges, and the discharge of dredged or fill material. Section 404 of this Act establishes the requirement for a permit from the US Army Corps of Engineers for the discharge of dredged or fill material into wetlands and other "...waters of the US." Section 402 establishes the National Pollutant Discharge Elimination System (NPDES), which requires permits for the point source discharge of pollutants other than dredged or fill material into waters of the US. That permit program is administered by the USEPA but has been delegated, in most states, to the state agency with authority for water quality.

Wetlands

Wetlands are defined in the US Corps of Engineers Wetland Delineation Manual as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (US Army Corps of Engineers Waterways Experiment Station, Environmental Laboratory, 1987). Jurisdictional wetlands in the US meet three wetland delineation criteria (hydrophytic vegetation, hydric soils, and wetland hydrology) and are protected under Section 404 of the Clean Water Act (33 USC Section 1344) and its implementing regulations found in 40 CFR 230.

The Florida Department of Environmental Protection (FDEP) environmental resource permitting program under Part IV, Florida Statutes Section 373 includes wetlands regulations. Florida's wetland program regulates dredge and fill activities in both freshwater and saltwater under their jurisdiction. Jurisdictional waters also include surface waters that are present all year and are greater than ten acres at a minimum average depth of two feet existing throughout the year, and permanent flowing streams and tributaries. Waters adjoining Florida's coastline are also under the state's jurisdiction. The limit of jurisdiction can be challenged by the absence of hydric soils. Forestry operations are exempt from the permitting process. Permit applications made to the FDEP can also serve as joint applications to initiate concurrent review by the US Corps of Engineers.

3.7.1.2 Executive Order 11990 – Protection of Wetlands

This order of May 24, 1977 directs federal agencies to take action to protect wetlands on their property and mandates review of proposed actions on wetlands through procedures established by NEPA.

3.7.2 Gulf of Mexico Special-use Airspaces

Information on the Gulf of Mexico is derived from Thurman (1994). *The Gulf of Mexico is a bowl-shaped basin rimmed with a broad continental shelf that slopes down to a maximum depth of 11,800 ft (3,600 m) in the center. The Gulf is connected to the Caribbean Sea by the Yucatan Strait to the south and to the Atlantic Ocean by the Straits of Florida to the east.* The Straits of Florida reach depths approaching 3,280 ft (1,000 m). *The Caribbean Current flows through the Yucatan Straits with surface velocities as high as 2.8 mph (4.5 km/hour) in the main axis of the current, but the maximum surface velocities usually average less than 1.2 mph (two km/hour). The Caribbean Current carries warm waters, nutrients, and ocean salinity levels from the Guiana Current. The latter enters the Caribbean basin through the Lesser Antilles and is a portion of the South Equatorial Current.*

When the Caribbean Current passes through the Yucatan Strait, it creates a dome of water in the Gulf of Mexico that stands four inches (ten cm) higher than the Atlantic water southeast of Florida. This hydraulic head forces an intense flow to pass from west to east through the Straits of Florida. This flow is known as the Florida Current. East of Florida, it joins with water carried north by the Antilles Current and flows north along the Florida coast.

The water pressure within the Gulf of Mexico also helps to create the Loop Current within the Gulf. After surface water enters the Gulf through the Yucatan Strait, it loops clockwise around a warm temperature dome (> 79° F [26° C]) approximately in the middle of the Gulf and then flows to the Straits of Florida. The relative position and strength of the Loop Current is tied to the location of the 68° F (20° C) temperature gradient underwater.

The surface water temperatures in the Gulf generally range from 75° to 81° F (24° to 27° C) just off the Yucatan coast to 64° to 70° F (18° to 21° C) along the northern Gulf Coast. *The salinity of the surface water ranges between 36.0 and 36.3 ppt.* Along the northern Gulf Coast, runoff from the Mississippi River decreases salinity to depths of 164 ft (50 m) as far as 93 miles (150 km) from the coast. Near the surface in the influence area of the Mississippi River, salinity levels can drop to 25 percent. Water quality is also affected by discharges from Gulf Coast rivers laden with sediment and pollutants, which results in increased turbidity and lower dissolved oxygen levels. Water quality improves with distance from river mouths and port cities.

3.7.3 Atlantic Ocean Special-use Airspaces

The Gulf Stream is a major influence on the physical oceanography of the Atlantic Ocean warning areas off the coast of Florida. *Though the continental shelf is broad, in the warning areas east of Jacksonville, the Gulf Stream flows consistently northward over the slope and*

generally along the continental shelf edge, sticking closer to the coast than it does farther north. Currents and water masses underlying the warning areas are mainly influenced by the Gulf Stream's deflections, meanders, and flow. Mean current speeds range from 180 centimeters/second ([cm/sec] or 3.5 knots [kt]) near the surface to 40 cm/sec (0.8 kt) near the bottom (Lee and Waddell, 1983 in Southern Division, NAVFACENGCOM, May 1998). Additional current speed measurements from the region range from 30 cm/sec (0.6 kt) in December to 50 cm/sec (one kt) in July (DoN, 1989 in Southern Division, NAVFACENGCOM May, 1998).

The two main water masses in the Jacksonville, Florida area are shelf water and the Gulf Stream. The average position of the Gulf Stream's western wall is under the warning areas throughout the year. Although the Gulf Stream's position remains fairly stable in this region, lateral meandering does occur (DoN, 1995a in Southern Division, NAVFACENGCOM, May 1998). Depending on their phase, meanders can cause the Gulf Stream to be shoreward *or well seaward of its average axis. Frontal eddies, filaments, warm core rings, and cold core rings may form during development of a meander and move across the Jacksonville area and onto the shelf.*

Wave heights offshore of the Jacksonville area vary seasonally and average 1.2 m (3.9 ft). Waves are smallest from April to September (2.6 to 3.9 ft [0.8 to 1.2 m]) and largest from October to March (4.3 to 5.2 ft [1.3 to 1.6 m]). Waves greater than 3.3 ft (one m) occur most frequently during winter and least frequently during summer (DoN, 1989 in Southern Division, NAVFACENGCOM May, 1998).

Water quality testing conducted for the *Shock Testing of the Seawolf Submarine Draft Environmental Impact Statement* found that water quality is excellent *well offshore in the warning areas with high water clarity, low concentrations of suspended matter, dissolved oxygen concentrations at or near saturation, and low concentrations of contaminants such as trace metals and hydrocarbons (DoN, 1995a in Southern Division, NAVFACENGCOM May, 1998).*

3.7.4 IRs

All three IRs cross a great variety and number of water features – both northern Florida and southern Alabama are well endowed with surface water resources. The main rivers and lakes crossed by the IRs are listed below.

3.7.4.1 IR-015

Shortly after landfall on the east coast of Florida, the IR crosses the Tolomato River, which acts as an embayment between the barrier islands and the mainland and is part of the Intracoastal Waterway. Proceeding westward, the IR crosses the St. Johns River, which flows into the Atlantic Ocean at Jacksonville. In mid-peninsula, the IR crosses an area of lakes east of I-75. On the west side of the peninsula, it crosses the Suwannee River and the Steinhatchee River, which flow into the Gulf of Mexico.

3.7.4.2 IR-030-31

Soon after hitting landfall, the IR crosses Choctawhatchee Bay, which separates barrier islands from the mainland and carries the Intracoastal Waterway. Proceeding clockwise around the IR, the IR crosses the Shoal River, the Yellow River, the Escambia River, the Conecuh River, the Canoe River, the Alabama River, and Hals Lake. All these coastal plain rivers drain into the Gulf of Mexico. The wetlands are similar to those described for IR-015 above.

3.7.4.3 IR-032-033

After landfall on the east, the IR crosses the Ochlockonee River, the Apalachicola River, and its tributaries, the Chipole River and Juniper Creek, the Econfina River, and the Choctawhatchee River, all of which drain the coastal plain and flow south into the Gulf of Mexico.

3.7.5 Eglin AFB Targets

Overall, Eglin AFB includes 32 lakes (over 300 acres [120 hectares] of manmade ponds and natural lakes), 30 miles (48 km) of rivers, an extensive stream network covering approximately 600 acres (240 hectares), and 20 miles (32 km) of Gulf of Mexico shoreline. It is also adjacent to several estuarine bays along the Gulf of Mexico.

Specifically, the base is situated within the Choctawhatchee Bay and the Pensacola Bay basins. The Choctawhatchee River and Bay watershed encompasses nearly 5,350 sq mi (13,857 sq km) and spans portions of northwest Florida and southern Alabama. Choctawhatchee Bay is over 27 mi (43 km) long and varies from one to six mi (1.6 to ten km) in width, with depths ranging from ten to 43 ft (three to 13 m). Principal tributaries in the watershed include the Choctawhatchee and Pea Rivers, Wrights Creek, Sandy Creek, Pine Log, Seven Run, Holmes Creek, and Bruce Creek. The surface water flow of the Choctawhatchee River is provided by these tributaries as well as by spring and Floridan Aquifer groundwater contributions.

Choctawhatchee Bay connects to the Gulf of Mexico through the Pensacola Pass and East Pass. The health of the bay is being severely threatened by increased development in the Choctawhatchee Basin. Development in the northern portion of the bay is minimal due to Eglin AFB occupying most of the northern drainage area. The eastern and southern shores are experiencing rapid development (Choctawhatchee Basin Alliance [web site], 2001).

The Pensacola Bay system watershed covers nearly 7,000 sq mi (18,130 sq km) in northwest Florida and southern Alabama. It includes a series of interconnected estuaries, including Escambia Bay, Pensacola Bay, Blackwater Bay, East Bay, and Santa Rosa Sound, and three major river systems: the Escambia, Blackwater, and Yellow rivers. The Yellow River forms the northwest boundary of Eglin AFB in portions of Santa Rosa and Okaloosa counties. The entire system discharges into the Gulf of Mexico south of Pensacola, Florida. There are many creeks and streams within Eglin's boundaries. One of the largest creeks is the Live Oak Creek, which originates on Eglin AFB and runs basically north-south on the western half of the base.

The northwest Florida aquifers underlying the range at Eglin AFB include, in descending order from the surface: Surficial Aquifer (Sand-and-Gravel Aquifer), Intermediate System Aquifer, the Floridan Aquifer (one of the most productive sources of water in the United States, providing water for public, industry, agriculture, and rural uses in most of Florida) and the Sub-Floridan System Aquifer.

Eglin AFB is interspersed with wetlands that generally follow the surface hydrology of the base, particularly along the southern and northern borders. The National Wetlands Inventory has prepared a detailed wetlands map of the contiguous portions of Eglin AFB, although the separation into the types of wetlands was not clearly discernable. Wetlands are commonly found in other ecological matrices. Seepage slopes are common wetland features in the sandhills matrix, and depression wetlands are embedded throughout the flatwoods matrix.

The wetland/riparian matrix at Eglin AFB consists of 1,158 miles of streams and connected wetlands distributed among 12 watersheds (USAF, 2002). This matrix supports the greatest percentage of biodiversity per unit area on Eglin. The wetland/riparian matrix is impacted by 286 erosion sites, which are the primary sources of an estimated 90,000 tons of annual soil loss at Eglin. The depression wetlands are inundated most of the year, contain peat or sand substrates, and function to provide biodiversity preservation, floodwater storage, and water quality through filtering. The seepage slope wetlands, on or at the base of the sandhills matrix, have a semi-impermeable soil layer that is usually saturated but rarely inundated. The seepage slope wetlands are within the sandhill areas that have clay-rich soils in the northeastern and eastern parts of the base. The floodplain wetlands are flat, have alluvial sand or peat substrates, and are subject to seasonal flooding but not permanent inundation; they function to provide biodiversity maintenance, species corridors, floodwater storage, and water quality through filtering.

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4 ENVIRONMENTAL CONSEQUENCES

This chapter presents an assessment of the potential environmental impacts that would result if the Proposed Action is implemented. Direct and indirect impacts are considered, as well as cumulative and unavoidable adverse impacts. This chapter also addresses irreversible and irretrievable commitments of resources along with the relationship between short-term uses of the environment and long-term productivity. Information from Chapters 1, 2, and 3 and the *Tomahawk Flight Test Operations on the West Coast of the United States* (Southwest Division, NAVFACENGCOM, October 1998) was used to develop impact analyses for this chapter.

The environmental consequences are described for each reasonable alternative, following the order of a TLAM flight test – from the ship or submarine launch, to the cruise flight over water and land, to missile termination at established land-based targets and test areas. Impacts addressed under NEPA (the EA) are provided first, followed by a discussion of impacts addressed under EO 12114 (the OEA) in italicized print. As stated in Chapter 2, the alternative to the Proposed Action is the No Action Alternative.

4.1 Land Use and Airspace

4.1.1 No Action Alternative

Under the No Action Alternative, targets within Eglin AFB's B-70 Test Area would continue to be fired upon from the EWTAs in the Gulf of Mexico and from warning areas that adjoin the EWTAs (W-151, W-470, W-168, W-174, and W-155); from the Atlantic Ocean off the coast of Jacksonville (W-157 and W-158); and from the Atlantic off the coast of Miami (W-465 and the ADIZ slightly north of W-465). The TLAM Program would continue to use special-use airspace, namely IR-030/031, IR-032/033, IR-015, restricted airspace R-2914A, R-2915A, R-2915B, R-2919A, and the Eglin E MOA.

4.1.1.1 Land and Surface Use

Current land and surface uses of those areas described above would continue under the No Action Alternative. Surface vessel traffic in warning areas, both within the EEZ *and outside the EEZ*, would continue to be unrestricted. The Navy would continue to clear the launch hazard area, or wait until other vessels leave the launch hazard area, prior to launching the TLAM. Because testing only occurs 12 times per year, the closures for the launch phase have little impact on commercial and recreational fishing, commercial shipping, or recreational boating. *Impacts on commercial and recreational fishing, commercial shipping, or recreational boating outside the EEZ would be essentially the same as within the EEZ, that is, minor.*

Jettisoned missile hardware would continue to fall within the launch hazard pattern (3,000 ft [914 m] by 3,000 ft [914 m], located about 6,000 ft [1,828 m] away from the launch site and generally in non-territorial waters). Because launch sites are chosen to avoid sensitive areas, the

flight tests would have little or no impact (falling hardware) on marine protected areas, such as the Florida Keys National Marine Sanctuary located to the north of W-465.

The cruise phase of TLAM testing currently causes, and would continue to cause, little disruption of current uses of land or waters underlying the warning areas (*both within and outside the EEZ*), IRs, and restricted airspace. The current TLAM testing is, and would continue to be, consistent with land use plans and policies for those areas, which are part of the No Action Alternative.

Missile terminations would continue to be at Eglin AFB Test Area B-70, which is already an active military target site used for various testing purposes. Continued use of Test Area B-70 for TLAM testing is consistent with its designated land use as a test area and would not conflict with planned future uses. Use of emergency termination areas (see Figure 2-5) would continue to be consistent with current and planned use of these areas.

4.1.1.2 Airspace

Airspace use under the No Action Alternative would continue to include use of the EWTAs and associated warning areas for TLAM launches; use of the three IRs for the cruise phase of TLAM flight tests; and use of restricted airspace R-2914A, R-2915A, R-2915B, R-2919A, and the Eglin E MOA for the final part of the cruise phase and missile termination. Continued use of these areas is consistent with their designated uses.

IRs 030/031 and 032/033 were established specifically for the TLAM Program (Section 3.1.3) over a decade ago. IR-015 was evaluated and approved at that time for use as an alternate route for IR-032/033 (Naval Air Test Center, 1991). The three IRs were selected to minimize overflights of populated areas and, thus, cross largely rural areas of the state. The IRs are reviewed annually to determine if changes to the IR are necessary to avoid any new noise sensitive areas resulting from new development or to identify any new obstacles along the IR.

For each IR, the Navy has identified particular "no-fly" zones, namely cities, other places where people are likely to be concentrated, and industrial areas (such as tank farms). These "no-fly" zones are areas where a lateral separation of one nmi (1.2 mi or 1.9 km) must be maintained between the missile/chase aircraft and the populated area (an exceptions is flights using TERCOM maps).

The TLAM and chase aircraft currently fly, and would continue to fly, within the range of altitudes specified for each IR. Chase and support aircraft accompanying the TLAM during the cruise phase would continue to comply with all FAA regulations and operations manuals regarding proper flight procedures and patterns. Notification would continue to be provided to civil, general, and other military aviation through NOTAM about any scheduled TLAM flight tests. If nonparticipating aircraft were detected during a TLAM flight test, support aircraft would, as they do now, assume control of the missile to guide it away from any potential conflict.

Use of restricted airspace under the No Action Alternative would be consistent with its designated use as special-use airspace. There are no conflicts with future planned uses of the special-use airspace.

4.1.2 Proposed Action

All areas and impacts to those areas described under the No Action Alternative would also be part of the Proposed Action. Impacts to land and surface uses, airspace, and coastal zone resources within Florida and Alabama (Section 4.1.1) would be similar under the Proposed Action. Also, the new TLAM-E variant would be deployed, which is very similar to the TLAM-C with the exception that it does not carry or deploy a REM package (parachute) and, thus, always terminates in a "hard" impact. Therefore, the remaining discussion of impacts to land and surface use, airspace, and coastal zone management addresses the additional areas (established Eglin AFB ranges at Test Areas B-75, C-52, and C-72) included in the Proposed Action.

4.1.2.1 Land and Surface Use

The Proposed Action would result in few, if any, changes to existing land and surface uses. No construction activities are proposed. The Navy would clear the launch hazard area, or wait until other vessels leave the area, before launching the TLAM. TLAM launches would occur 12 times or fewer per year, with little if any impact on commercial and recreational fishing, commercial shipping, or recreational boating. *Impacts on commercial and recreational fishing, commercial shipping, or recreational boating outside the EEZ would be essentially the same as within the EEZ, that is, minor.*

The ranges at Eglin AFB are established ranges used for air-to-ground gunnery and munitions tests, including bombs, guided missiles, rockets, and submunitions. Use of these facilities for TLAM testing would be consistent with their designated present uses. Minimal conflict is anticipated between TLAM testing and other planned uses of any of these test areas.

The proposed TLAM testing would be consistent with planned or adopted land use policies. Thus, implementation of the Proposed Action would have minimal adverse effects on land or surface use. No mitigation measures would be required.

4.1.2.2 Airspace

No changes in airspace are proposed for the Proposed Action.

As with the No Action Alternative, notification would be provided to civil, general, and other military aviation through NOTAM about any scheduled TLAM flight tests. If non-participating aircraft are detected during a TLAM flight test, support aircraft could assume control of the missile to guide it away from any potential conflict.

Because the Proposed Action would not disrupt current airspace uses and because of the infrequency of TLAM flight tests, there would be only minor impacts to airspace uses. No mitigation measures would be required.

Areas that would be impacted by the Proposed Action include those areas described under the No Action Alternative and the Eglin AFB Test Areas B-75, C-52, and C-72. Impacts to land and surface uses, airspace, and coastal management in the additional three test areas would be the same as described Sections 4.1.1. If emergency terminations were needed, these would be diverted to areas well away from sensitive areas. Impacts to land and surface use, airspace, or

coastal zone management (see below) would be insignificant with implementation of the Proposed Action. No mitigation measures would be required.

4.1.3 Coastal Zone Management

Demands placed on lands and waters of the coastal zone from existing economic development and population growth require that new projects or actions be carefully planned to avoid stress on the coastal zone. This planning involves a review of state and local enforceable policies, which are designed to provide effective protection and use of land and water resources of the coastal zone.

Warning areas that would be used for TLAM launches off Florida's east coast are all outside of the coastal zone, which extends 5.6 km (three nmi) into the Atlantic Ocean. Although some of the special-use airspaces in the Gulf of Mexico are within Florida's coastal zone, 16.7 km (nine nmi) and Alabama's coastal zone, 22.2 km (12 nmi), TLAM launches would be conducted well beyond 22.2 km (12 nmi) of the shore. As a result, the launch phase of a TLAM flight test would not affect the coastal zone. Only the cruise and termination phases have the potential to do so.

The following discussion focuses on areas within the coastal zone which are below IRs and at the Eglin AFB Test Areas. Several areas within Florida's coastal zone lie below IRs. Only a small portion (approximately 20 sq km [7.7 sq mi]) of coastal zone in Baldwin County, Alabama lies below IR-030/031.

4.1.3.1 No Action Alternative

Florida – State Enforceable Policies

The 12 enforceable policies issued by Florida for the coastal zone, which are relevant to TLAM flight tests, are listed in Subchapter 3.1. The following sections address the consistency of TLAM flight tests with those policies (see Appendix D for CZMA Consistency Determination).

State Parks and Preserves

The No Action Alternative is consistent with policies designed to preserve, manage, regulate, and protect parks, recreational areas, and aquatic preserves held by the Florida because potential noise impacts would not be significant along IR areas (see Subchapter 4.4).

Recreational Trails System

TLAM flight tests would be consistent with policies designed to create recreational trails and facilitate the management of them because no construction or other trail-disturbing activities would be required to support the No Action Alternative. The use and maintenance of trails under IRs and near Eglin AFB would not be affected by potential noise impacts (see Subchapter 4.4).

Historical Resources

There would be no development or demolition impact to cultural resources located under IRs because, during the missile cruise phase, the flight test involves air operations only. No noise impacts to cultural resources would occur because peak noise levels for TLAM flight tests would not be excessive. As such, the No Action Alternative is consistent with policies designed to protect Florida's historical assets.

Saltwater Fisheries

The No Action Alternative is consistent with policies designed to protect and conserve saltwater fisheries because TLAM flight tests would not affect waters of the coastal zone below IRs. All jettisoned material would fall within the launch hazard pattern, which would be positioned well outside of the coastal zone.

Wildlife

TLAM flight tests would be consistent with policies designed to conserve and manage wildlife and freshwater aquatic life because noise impacts to wildlife would be insignificant (see Subchapter 4.4.1).

Water Resources

Water consumption would only be required for a limited number of personnel needed to support TLAM flight tests. Therefore, the No Action Alternative would be consistent with policies intended to regulate the construction and operation of stormwater management systems and the withdrawal, diversion, storage, and consumption of water.

Outdoor Recreation and Conservation

TLAM flight tests would be consistent with policies designed to acquire and manage lands, water areas, and related resources for the purpose of outdoor recreation and conservation because potential noise impacts would not be significant along IR areas (see Subchapter 4.4).

Pollutant Discharge, Prevention, and Removal

There is a small risk that surface water resources could be contaminated by JP-10 fuel released subsequent to a TLAM failure during cruise phase. Missile terminations would continue to occur at Eglin AFB Test Area B-70, which is already an active military target site used for various testing purposes. Range management standard operating procedures would be followed during the termination of all TLAM flight tests to prevent the discharge of any pollutants. As a result, the No Action Alternative would be consistent with policies designed to prevent, control, and abate pollutant discharges.

Land and Water Management

The No Action Alternative would be consistent with policies concerning land and water management because continued use of Test Area B-70 for TLAM testing is consistent with its

designated land use as a test area and would not conflict with planned future uses. Use of restricted airspace under the No Action Alternative is consistent with its designated use as special-use airspace. There are no conflicts with future planned uses of the special-use airspace (see Subchapter 4-1).

Public Health

The No Action Alternative is consistent with public health policies and would not adversely affect public health or significantly degrade groundwater or surface waters.

Environmental Control

The No Action Alternative is consistent with environmental control policies because TLAM flight tests would not cause significant adverse impacts to air quality. Air quality is slightly and temporarily affected by the emissions associated with the missile flight tests and chase and relay aircraft flights (see Subchapter 4.3).

Soil and Water Conservation

Soil and water conservation policies are and would continue to be followed at Eglin AFB Test Area B-70 for proper control and prevention of soil erosion. Therefore, the No Action Alternative is consistent with soil and water conservation policies.

Florida – County Enforceable Policies

Santa Rosa County

The following table (Table 4.1-1) addresses the applicability of Santa Rosa County's coastal management policies to the No Action Alternative and consistency with those policies when applicable.

Okaloosa County

The following table (Table 4.1-2) addresses the applicability of Okaloosa County's coastal management policies to the No Action Alternative and consistency with those policies when applicable.

Table 4.1-1
Santa Rosa County
Land Use/Coastal Zone Management Policy Categories

Resource Protection Policies	Applicability
Protect, conserve or enhance coastal wetlands, living marine resources, coastal barriers, and wildlife habitats	Consistent
Maintain and/or improve estuarine environmental quality	Consistent
Criteria and standards for shoreline land-uses	Not Applicable
Construction standards to minimize impacts to shorelines, bayous and estuarine systems, and to protect those systems	Not Applicable
Coastal high hazard area provisions and building regulations	Not Applicable
Redevelopment and elimination of unsafe conditions and inappropriate uses	Not Applicable
Hurricane evacuation times	Consistent
Post-disaster redevelopment plans	Not Applicable
Public access to beach or shoreline	Not Applicable
Protection, preservation, or sensitive re-use of historic resources	Consistent
Development in coastal areas	Not Applicable
Air quality	Consistent
Water quality and quantity	Consistent
Conserve, protect and manage earth resources	Consistent
Conserve, use and protect fisheries, fishery habitats, wildlife habitats and other marine or wildlife resources	Consistent

Table 4.1-2
Okaloosa County
Land Use/Coastal Zone Management Policy Categories

Resource Protection Policies	Applicability
Protect and restore beaches and dunes, comply with construction standards to minimize impacts of man-made structures on beach or dune systems	Not Applicable
Preserve and protect environmental quality of estuaries, coastal wetlands, living marine resources, and coastal barriers	Consistent
Increase public access to beach or shoreline	Not Applicable
Coastal high hazard area provisions	Not Applicable
Hurricane evacuation times	Consistent
Post-disaster redevelopment plans	Not Applicable
Redevelopment of deteriorating urban waterfronts	Not Applicable
Protection or sensitive preservation and reuse of historic resources	Consistent

Walton County

The following table (Table 4.1-3) addresses the applicability of Walton County's coastal management policies to the No Action Alternative and consistency with those policies when applicable.

Table 4.1-3
Walton County
Land Use/Coastal Zone Management Policy Categories

Resource Protection Policies	Applicability
Limit specific and cumulative impacts of development/redevelopment on wetlands, coastal dune lakes, water quality/quantity, wildlife habitat of listed species, living marine resources, or other natural resources	Not Applicable
Channeling untreated runoff from development/redevelopment or new roads	Not Applicable
Compliance with state and federal regulations pertaining to endangered and threatened species	Not Applicable
Development permit compliance with natural resource permits	Not Applicable
Development within floodplains	Not Applicable

Alabama – State Enforceable Policies

The three general rules issued by Alabama for the coastal zone, which are relevant to TLAM flight tests, are listed in Subchapter 3.1. The following sections address the consistency of TLAM flight tests with those policies (see Appendix D for CZMA Consistency Determination).

Air Quality Standards

The No Action Alternative is consistent with policies designed to protect air quality because TLAM flight tests would not cause significant adverse impacts to air quality. Air quality is slightly and temporarily affected by the emissions associated with the missile flight tests, chase and relay aircraft flights (see Subchapter 4.3).

Cultural Resources

TLAM flight tests would be consistent with policies designed to protect cultural resources because potential noise impacts would not be significant along IR areas (see Subchapter 4.4).

Wildlife and Fishery Habitat

The No Action Alternative is consistent with policies designed to protect wildlife and fishery habitat because no construction or other development would be required to support TLAM flight tests. There is a small risk of contamination of surface water resources, which could be habitat used by some fishes, by JP-10 fuel released subsequent to a TLAM failure during cruise phase. Avian habitat below IRs would not be significantly affected by the cruise phase of TLAM flight testing because overflights occur at altitudes high enough to prevent significant disturbances from noise levels (see Subchapter 4.5).

4.1.3.2 Proposed Action

The Proposed Action would have essentially the same impacts on coastal resources as the No Action Alternative, and thus be consistent with the relevant Florida and Alabama enforceable policies.

4.1.3.3 Consistency Determination

The DoN, through the EA process, has determined that implementation of the No Action Alternative or the Proposed Action would be fully consistent with state and county enforceable policies of the Florida and Alabama Coastal Management Programs. A consistency determination was submitted to the FL coastal management program since the proposed action could lead to potential impacts to Florida's Coastal Zone at additional target areas at Eglin AFB. Concurrence was received 13 August 2004 (see Appendix D).

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4.2 Public Health And Safety

Activities would occur in areas of low population density and would avoid or minimize proximity to population centers (see Subchapter 3.2.1). Also, see previous discussion of land use impacts in Subchapter 4.1.

4.2.1 No Action Alternative

4.2.1.1 Overall Risk of Crashes Occurring on Non-Military Lands

Current and proposed TLAM flights consist of three phases - launch, cruise, and termination. The launch phase consists of the missile launch, missile propulsion by a solid rocket booster, and transition from the booster engine to the turbofan jet engine. For East Coast training, this phase would continue to occur entirely over sea ranges or other ocean waters that are clear of vessel traffic. Thus, the jettison of the booster engine and protective covers and the deployment of wings and fins would occur over open water that is clear of vessel traffic.

The cruise phase starts once the missile is in stable flight and under jet propulsion. During this longest phase, the missile presently flies (and would continue to fly under the No Action Alternative) from launch areas within the Gulf of Mexico over water to targets within the B-70 Test Area on Eglin AFB, or from warning areas east of Jacksonville, Florida over land and Gulf waters to the B-70 targets. All flight segments over nonmilitary land during cruise phase occur only in established IRs, which were originally selected to avoid population centers as much as possible.

Six missiles out of 235 test flights (2.6%) have failed over non-military areas (see Subchapter 2.2.4) since the inception of the TLAM Program. Only four of these failures (1.7%) resulted in crashes on non-military land. One failure resulted in a crash in the water within an established warning area, and the other failure was manually terminated in a designated emergency termination area. Based on this historical probability of failure during cruise phase, it is reasonable to believe that as many as six cruise phase failures could occur over the next twenty years of TLAM testing. However, investigations into the causes of these crashes have led to the correction of the causes contributing to these failures. Missile failure during cruise phase over non-military land would continue to be rare and would not present a significant impact to public health and safety based on: (1) the limited number of TLAM tests that would be conducted along IRs and, therefore, over publicly-accessible land (as many as six times a year); (2) the low percentage of missile failures during cruise phase resulting in a crash on non-military lands (1.7%); (3) the small area that would be affected by a TLAM crash; the primary impact area is an oval approximately 900 ft (274 m) long and 336 ft (101 m) wide, and the secondary debris area extends approximately 2,600 ft (792 m) from the primary impact area, and; (4) the tendency for lower population densities beneath the IRs.

The TLAM Program annually reviews all IRs to determine if any changes to the routes are necessary to avoid noise sensitive areas, areas of high risk, or other obstacles within the

corridors. This requirement further reduces the possibility of impacts to population centers and other sensitive areas.

The established health and safety practices also minimize the likelihood of a TLAM anomaly resulting in a casualty. These health and safety practices include the pre-launch procedures, pre-launch reconnaissance of the launch hazard area, in-flight operational safety measures for ground and air crews, safety features built into the missile itself, and emergency response procedures (as discussed in Subchapter 3.2, Public Health and Safety).

4.2.1.2 Risk to Airspace

The entire TLAM flight test is and would continue to be conducted within airspace designated for military use. NOTAMs and NOTMARs are released well prior to the flight through normal FAA and U.S. Coast Guard procedures. These notices detail a block of time when the missile test would occur. To avoid collisions with other aircraft, the TLAM is and would continue to be escorted by at least two chase aircraft during the flight test, whose crews monitor the IR for other aircraft not participating in the flight test both visually and with radar. These crews can, if necessary, assume control of the missile.

There have been no reported missile collisions with aircraft in any prior TLAM flight test using the East Coast flight facilities. Thus, the probability of an accidental collision with another aircraft is low.

4.2.1.3 Risk from Hazardous Materials

Health and safety impacts to military personnel coming into contact with missiles containing DU, JP-10 fuel, and both lithium and thermal batteries are not now and would not be significant with implementation of the No Action Alternative, as long as the standard operating procedures, as outlined in Subchapter 3.2, Public Health and Safety, are followed. Although there is a remote possibility a person might encounter a crashed TLAM on non-military land, the low population under the IR routes, the redundant systems and safety features of the TLAM, the careful exercise planning, and the mitigation measures in case of a mishap (outlined in Section 3.2) minimize the risk to public safety. Materials that may be spilled during the crash of a TLAM would pose no risk to public safety in the quantities described in sections 3.2.5 and 3.2.6.

None of the flight tests presently conducted on the East Coast or to be conducted under the No Action Alternative involves live ordnance, and all TLAMs currently tested and which would continue to be tested under the No Action Alternative include an REM package with a parachute recovery system to facilitate soft landings. Thus, there would be no explosion upon impact unless the remaining or residual fuel ignited. Any risk of a TLAM termination igniting a wildfire outside a target or emergency termination area would be low for the following reasons: (1) few flight tests would be conducted each year, with some occurring almost entirely over the ocean; (2) the probability of a crash is almost zero (because of the capability of deploying the REM parachute); (3) live-warheads are not carried by East Coast test missiles and therefore would not detonate even if a parachute is not deployed and the missile crashes; (4) fuel is usually depleted before reaching the target area; and (5) target and emergency termination areas are cleared of vegetation or are in the ocean waters. The TLAM Program, as an extra precaution, has developed

fire response procedures as part of the development of missile recovery procedures, including coordination with large landholders (such as the US Forest Service) along the test flight route. These procedures frequently involve a joint response (see Subchapter 3.2, Public Health and Safety).

TLAM-N missiles, which carry DU payloads, are always equipped with parachute recovery systems. Thus, TLAM-Ns would only impact targets and emergency terminations with a soft landing. DU used for the TLAM counterbalance is contained in an oxidation resistant alloy and, therefore, would be unlikely to be released into the environment. Even if dome release occurs, it would have little, if any, effect on public health for the reasons outlined in Subchapter 3.2. Thus, implementation of the No Action Alternative would have a negligible impact to public health.

4.2.2 Proposed Action

Implementation of the Proposed Action would result in similar low risks to public health and safety as the No Action Alternative, with the exception that the new variant (TLAM-E) would be deployed. The TLAM-E includes an RSS telemetry package. It does not include an REM package with a parachute. Therefore, termination of this variant would result in a hard impact with the ground. The probability of a failure during cruise phase resulting in a crash on non-military land is still very low (about 1.7%), and only a very small area at the termination site would be affected. The primary impact area is an oval approximately 900 ft (274 m) long and 336 ft (101 m) wide, offset from the missile flight track by approximately 36 ft (11 m) (the offset is due to the hard right turn that initiates the termination). A secondary debris area, extending approximately 2,600 ft (792 m) from the primary impact area, represents the maximum extent to which debris may be thrown. Once again, the precautions taken by the test team would minimize the potential for injury to anyone on the test team or the public.

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4.3 Air Quality

4.3.1 No Action Alternative

The No Action Alternative would continue to occur in the same way as in existing operational conditions in areas of Florida and Alabama that are designated as being in attainment for all criteria pollutants (NAAQS) with the exception of Duval County, Florida, which is an O_3 maintenance area. Air quality conditions under the No Action Alternative would not differ from existing conditions as described in Subchapter 3.3.

The ongoing TLAM flight tests conducted under the No Action Alternative would cause minor adverse effects to air quality. Air quality would be slightly and temporarily affected by the emissions associated with the missile flight tests, launch vessels, chase and relay aircraft flights, vehicles, and generators. This combination of emissions would not significantly impact air quality for several reasons:

- The testing is infrequent (12 flights or fewer per year).
- Inert-warhead missiles are used.
- The emissions are spread out over many miles.

Impacts to air quality in warning areas outside of US territorial seas would be limited to emissions from launch vessels, portions of missile flights, and support aircraft. These impacts would also be insignificant because of the temporary nature of emissions from TLAM tests and the low frequency of tests.

4.3.2 Proposed Action

The Proposed Action would take place in areas that are designated as being in attainment for all criteria pollutants (NAAQS), with the exception of the continued use of IR 032/033, which partially passes above Duval County, Florida, which is an O_3 maintenance area. Only minor impacts to air quality would occur, even without any mitigation measures.

The Proposed Action would occur within the areas described under the No Action Alternative. Anticipated emissions from the new variant (TLAM-E) of the TLAM would be similar to the emissions from current variants. Overall emissions from flight tests would be the same as for the No Action Alternative, both within and *outside territorial waters*. Therefore, flight operations along IR 032/033 would result in no foreseeable new emissions within Duval County as compared to existing conditions and the No Action Alternative. According to the general conformity rule, a formal conformity determination is not required for this federal action and potential air quality impacts would not be significant. The Record of Non-Applicability is provided in Appendix E.

The remaining discussion of impacts to air quality applies to areas not currently used for TLAM testing, namely the established Eglin AFB ranges at Test Areas B-75, C-52, and C-72. Air quality in these areas would be slightly and temporarily impacted by the emissions from TLAMs,

chase and relay aircraft flights, vehicles, and generators used in TLAM testing. As with the No Action Alternative, this combination of emissions would have an insignificant impact on air quality for the same reasons – infrequent testing, use of inert-warhead missiles, and emissions that would be spread out over a large area.

4.4 Noise

This assessment of noise impacts for East Coast TLAM flight tests relies, in part, on information developed for the *Tomahawk Flight Test Operations on the West Coast of the United States: Final Environmental Assessment* (Southwest Division, NAVFACENGCOM, October 1998), and partly on analyses conducted specifically for this EA/OEA.

Areas potentially impacted by noise generated by both the existing and proposed TLAM Testing Programs include:

- Launch areas (from missile launch operations).
- Air stations (used for chase aircraft landing and takeoff).
- Areas underlying the IRs (from missile and chase aircraft overflights).
- Target areas (from low-flying missiles and missile impacts during hard landings).

Since the proposed testing program would involve only 12 or fewer test events each year, and the speed of the TLAM and accompanying aircraft would be such that a person on the ground would be exposed to flight-generated noise for only 21 seconds, potential noise impacts would be short in duration. Noise impacts from launch and termination into the target areas would be similar to those from a typical military training event, such as a heavy weapon firing, and would be impulsive in nature. Therefore, the USACHPPM- guidelines for evaluating impulsive blast noise levels generated from military tests and training (see Table 3.4-1) have been used in the following analysis.

4.4.1 No Action Alternative

4.4.1.1 Launch Area

The Navy would continue to launch current variants of the TLAM from Navy ships or submarines up to 12 times per year. The missile launches would generate brief, impulsive noise during the launch. According to the TLAM engine noise levels described in the *Tomahawk Flight Test Operations on the West Coast of the United States: Final Environmental Assessment* (Southwest Division, NAVFACENGCOM, October 1998), the TLAM sound exposure level (SEL) measured at a 50-ft (15- m) distance from the static engine exhaust was 119 dBA.

If the noise in dBA SEL is converted to a dBP metric to make a comparison with the available impulsive noise guidelines, the maximum noise currently generated by the launch is about 129 dBP (assuming the measured 119 dB is in dBA) near the source, and about 115.5 to 120.5 dBP within a few hundred feet from the source. According to the noise guidelines established for blast noise levels by the USACHPPM, these levels result in low risk of complaints (less than 115 dBP) or moderate risk of complaints (115 – 130 dBP) depending on the distance to the launch site. These levels are also considerably less than the thresholds currently used to assess impacts on marine mammals (195 dB for a temporary threshold shift and 215 dB for a permanent threshold shift - see Subchapter 4.5).

The Navy would, as standard operating procedure, continue to ensure that the launch site is clear of civilian boats, and located offshore, well away from any sensitive noise receptors. Persons subject to noise from the missile launch would be only those military personnel participating in the launch. To prevent adverse noise effects to participants at the launch site, personnel would continue to follow standard operating procedures and use appropriate hearing protection. Therefore, continued testing under the No Action Alternative would have insignificant noise impacts on humans at the launch area. Noise effects on marine mammals and other wildlife are addressed in Chapter 4.5.

4.4.1.2 Air Station

The air station where chase aircraft sorties originate for any particular test event would experience a short duration of noise during landing and takeoff (LTO). However, these LTOs would be consistent with the overall current operations at these air stations. Potential noise impacts generated by TLAM testing would be insignificant.

4.4.1.3 IR Areas

The missile and chase aircraft involved in a test flight normally fly at an altitude about 2,500 ft (762 km) over most of IRs currently used for TLAM testing in Florida and Alabama. These aircraft travel at a speed of about 520 mph (837 kph), which is less than the speed threshold for a sonic boom (750 mph or 1,207 kph). At these speeds, a person on the ground would be exposed to noise from the flyover for a total period of only about 21 seconds (Southwest Division, NAVFACENGCOM, October 1998); thus, the guidelines for impulsive noise established by the Army are the most appropriate metric for determining the level of impact (USACHPPM, May 2001).

The noise levels from a TLAM flyover were estimated in the *Tomahawk Flight Test Operations on the West Coast of the United States: Final Environmental Assessment* (Southwest Division, NAVFACENGCOM, October 1998). The noise levels generated by each type of chase aircraft during an overflight were estimated for most types of aircraft using the US Army-developed aircraft flyover noise model, *Menu 10*. The aircraft noise data in the *Menu 10* model are the same as those used in the DoD's *NOISEMAP* noise model. However, the flyover noise levels from an F/A-18 E/F (Super Hornet) were based on typical pattern flight noise data published in *Noise Study for the Introduction of F/A-18 E/F to the East Coast* (Wyle Laboratories, April 2003).

Table 4.4-1 summarizes the peak sound levels generated along an IR area by each type of source when a missile or a chase aircraft flies at an altitude of 2,500 ft (762 km). Maximum noise levels would occur directly underneath the flight track and would decrease at greater distances from the flight track. The peak levels would remain below the 105-dBA (equivalent to 115-dBP) threshold identified by the USACHPPM for low risk of noise complaints (see Table 3.4-1), and potential noise impacts along an IR would be insignificant. The peak noise levels summarized in Table 4.4-1 represent aircraft event peak noise occurring within one second time duration, and therefore, there is little to no cumulative effect for noise during such a short duration. Therefore, using this noise metric, the loudest aircraft results in the highest peak noise.

Table 4.4-1
Noise Levels from Tomahawk Flight Test Overflights

Aircraft Type	Number of Aircraft	Assumed Minimum Flight Altitude (feet AGL)	Peak dBA at Ground Level			
			Under Flight Path	500 feet from Ground Track	1,000 feet from Ground Track	1,500 feet from Ground Track
IR Area						
Tomahawk[1]	1	2,500	90.2	90.0	89.3	88.4
F-4 Jet	1	2,500	96.5	96.2	95.7	94.5
F-14 Jet	1	2,500	82.2	81.9	81.2	80.0
F-15 Jet	1	2,500	95.6	95.4	94.6	93.5
F-16 Jet	1	2,500	89.7	89.5	88.7	87.6
F-18 Jet	1	2,500	95.9	95.5	94.6	93.7
F/A-18 E/F Jet[2]	1	2,500	101.3	99.2	98.8	98.9
Target Area						
Tomahawk[1]	1	500	106.3	103.1	98.7	95.2
F-4 Jet	1	500	114.6	110.8	106.3	102.2
F-14 Jet	1	500	102.0	98.0	93.5	88.5
F-15 Jet	1	500	113.9	110.0	105.5	101.3
F-16 Jet	1	500	107.8	104.0	100.0	95.4
F-18 Jet	1	500	115.5	111.0	107.0	102.1
F/A-18 E/F Jet[2]	1	500	116.0	114.6	111.1	107.8

Sources: [1] Southwest Division, NAVFACENGCOM, October 1998.
[2] Wyle Laboratories, April 2003.

4.4.1.4 Target Area

When the missile and chase aircraft enter the restricted area of Eglin AFB B-70 Test Area, they may drop as low as 500 ft (152 m) AGL. Many missile flight tests end with a parachute landing of the missile — the missile climbs to an altitude of 3,000 ft (914 m) above ground before the engine shuts off and the parachute deploys.

Table 4.4-1 summarizes peak sound levels from each source during the TLAM and chase aircraft descend (altitude of 500 ft [152 km] AGL) to the target areas. Maximum noise levels occur directly under the flight track. The peak noise levels summarized in Table 4.4-1 represent aircraft-event peak noise occurring within a one-second time duration, and therefore, there is little or no cumulative effect for noise during such a short duration. Using this noise metric, the loudest aircraft results in the highest peak noise.

The maximum peak noise level from a TLAM as it approaches the target is about 106 dBA (see Table 4.4-1), which barely exceeds the threshold for low risk of noise complaints (105 dBA or 115 dBP). These levels occur and would continue to occur (if the No Action Alternative is implemented) at the target areas, far away from sensitive noise receptors. Target areas are already exposed to frequent noise from testing of other weapons systems. Therefore, the

potential noise impacts from a low-flight missile near the target area is and would continue to be insignificant.

The maximum peak noise generated by a low-flight chase aircraft is about 116 dBA at the location directly under the flight track for an F/A-18 E/F jet. This level is equivalent to about 126 dBP (assuming the maximum ten-dB difference between dBA in SEL and dBP) and results in moderate risk of complaints (115 – 130 dBP) according the USACHPPM's guidelines. Under the No Action Alternative, these noise levels would continue to occur at the target areas. Therefore, the potential noise generated near the target area from occasional TLAM lights currently are insignificant and would continue to be insignificant.

4.4.2 Proposed Action

This alternative would involve continued testing in Florida at the current rate (up to 12 flights per year) but with the new variant (TLAM-E) as well as current TLAM variants. Eglin AFB target areas (B-75, C-72 and C-52) would be used to support TLAM testing for the first time, as well as the B-70 area that is currently used (see Figure 2-6). Potential noise impacts are expected to be essentially the same as for the No Action Alternative. The TLAM-E has the same engine as the other variants, and the noise generated by this missile is expected to be about the same as for the other variants.

4.5 Biological Resources

4.5.1 No Action Alternative

Biological resources with the potential to be impacted by the No Action Alternative include those resources contained within the Florida launch areas, Florida and Alabama IRs, and the Eglin AFB Test Area B-70. Descriptions of impact analyses are provided below for each resource section. The potential impacts to these resources include:

- Noise generated by the launch.
- Noise generated by the TLAM and chase aircraft during cruise phase.
- Direct impacts on vegetation, animals, sediments/soils, or habitat by jettisoned debris or the missile itself within the launch hazard area, the hazard footprint at the target, and the hazard footprint associated with emergency terminations.
- Physical impacts of ship collisions with marine mammals, sea turtles, and rafts of vegetation and associated habitat.

4.5.1.1 Vegetation

The No Action Alternative would continue to have little effect, if any, on vegetation (algae and seagrasses) in the Gulf of Mexico, Straits of Florida, and Atlantic Ocean, in both territorial and *nonterritorial waters*. Harmful increases in algal concentrations generally occur in response to eutrophication or change in water temperatures (NOAA State of the Coast website, accessed July 2002). Neither the movements of Navy vessels nor TLAM launches cause such changes.

TLAM flight tests do not affect *Sargassum* habitat in offshore waters. Navy vessels currently post lookouts with binoculars to watch for whales, sea turtles, and *Sargassum* rafts, to avoid collisions with these resources and would continue to do so. Navy vessel movement may shift floating rafts of *Sargassum*, causing some algal clumps to be downwelled. However, because of the bladder-like cysts in its leaves, *Sargassum* is buoyant and likely to resurface. Algal clumps, which lose their buoyancy, sink to the bottom and provide a resource for bottom dwellers (Coston-Clements, October 1991). The No Action Alternative does not now and would not affect the *Sargassum* FMP.

Impacts to seagrasses include natural disturbances (foraging, disease, storms, and surges) as well as anthropogenic impacts (South Atlantic Fishery Management Council, April 2002). The root system of seagrasses, which occur in shallow waters, can be damaged by boat propellers and vessel groundings (NOAA Restoration Center website, accessed July 2002). Other anthropogenic impacts include eutrophication, suspended sediments, and some fishing gear-related impacts. Water quality – in particular water clarity – is considered vital to maintaining healthy seagrass beds (South Atlantic Fishery Management Council, April 2002).

The movement of Navy vessels into TLAM launch sites occurs in deep waters, away from where seagrass beds are located. The missile hardware jettisoned during the launch phase falls within the launch hazard pattern, which is confined to a 9,000,000 sq ft (0.244 sq nm) area near the launch vessel, away from shallow waters or close to the shore.

Because the cruise phase of the flight test involves air operations only, impacts to terrestrial vegetation below IRs are unlikely to occur. Impacts could potentially occur during an emergency termination, but the probability for missile failure during the cruise phase is very small – less than two percent.

Flight tests presently conducted on the east coast or to be conducted under the No Action Alternative involves no live ordnance, and all TLAMs currently tested and that would continue to be tested under the No Action Alternative include a REM package. Thus, there would be no explosion upon impact unless the remaining or residual fuel ignited. Any risk of a TLAM termination igniting a wildfire outside a target or emergency termination area would be low for the following reasons: (1) few flight tests would be conducted each year, with some occurring almost entirely over the ocean; (2) the probability of a crash is low (because of the capability of deploying the REM parachute); (3) live-warheads are not carried by East Coast test missiles and, therefore, would not detonate even if a parachute is not deployed and the missile crashes; (4) fuel is usually depleted before reaching the target area; and (5) target and emergency termination areas are cleared of vegetation or are in the ocean waters. The TLAM Program, as an extra precaution, has developed fire response procedures as part of the development of missile recovery procedures, including coordination with large landholders (such as the US Forest Service) along the test flight route. These procedures frequently involve a joint response (see Subchapter 3.2, Public Health and Safety).

Test Area B-70 is subject to ongoing military testing and training, such as air-to-surface bombing and missile activity. Impacts to terrestrial vegetation from TLAM missile terminations would be consistent with the vegetative disturbance currently sustained and managed at Test Area B-70.

4.5.1.2 Wildlife

Shellfish and Finfish

Management of fishery resources within the 200 nmi (370 km) of Florida's east coast is performed by the South Atlantic Fishery Management Council through the use of FMPs. The Gulf of Mexico Fishery Management Council prepares FMPs, which are designed to manage fishery resources from where state waters end *out to the 200-nmi limit of the Gulf of Mexico.* Adverse impacts to shellfish and finfish generally result from overfishing, habitat degradation, and habitat loss. *Movement of Navy vessels in and out of launch sites and the TLAM launches would not compromise the productivity of these fisheries or adversely affect their management.*

Fish may exhibit avoidance behavior in response to a Navy vessel, but this response would be similar to that caused by other boat traffic. The No Action Alternative would have no adverse effects on fish habitat. Impacts on EFH are discussed in Subchapter 4.5.1.4, but adverse impacts to shellfish and finfish resources in the Gulf of Mexico, Straits of Florida, and Atlantic Ocean, both within *and outside territorial waters*, would not occur.

Sea Turtles and Marine Mammals

Impacts to sea turtles and marine mammals from the No Action Alternative would not occur with respect to the following potential impact areas, most of which would occur in nonterritorial waters: physical effects as a result of jettisoned missile hardware dropping into the water or a failed missile, collisions with ships, and effects of TLAM launch noise.

The probability for a marine mammal or sea turtle to be directly impacted as a result of being struck by jettisoned material or a failed missile would be very low. Tables 4.5-1, 4.5-2, and 4.5-3 list the estimated probabilities of striking a marine mammal or sea turtle in the Eastern Gulf of Mexico Operational Region, the Key West Complex Region, and the Jacksonville/Charleston Operations Area, respectively. These regions generally overlap the TLAM launch sites and initial flight paths. The calculations assume equal distribution of animals throughout the study area and describe the worst-case scenarios for impact (see Appendix C). These estimates are probably an overestimate, in that they estimate strikes at the time of maximum animal densities, and do not account for the seasonality of the migration habits of many species. Given the very low animal densities and the infrequency of TLAM launches combined with the mitigation measures outlined below, no marine mammal or sea turtle would be affected.

The potential for entanglement by jettisoned material would also be unlikely because the items jettisoned (see Table 2-2) are bulky in nature, not filamentous. Thus, impacts to marine mammals or sea turtles from direct impacts by failed missiles or jettisoned missile hardware is not anticipated.

Table 4.5-1
Probability of Impact for Marine Mammals and Sea Turtles in the Eastern Gulf of Mexico Operational Region

Occurrence	Small marine mammals (<10 ft long)	Medium marine mammals (10-33 ft long)	Large marine mammals (>33 ft long)	Sea turtles
Nearshore				
winter	6.12×10^{-16}	0	0	7.50×10^{-16}
spring	1.52×10^{-15}	0	0	1.19×10^{-15}
summer	5.00×10^{-16}	0	0	3.72×10^{-16}
fall	1.74×10^{-15}	0	0	5.11×10^{-16}
Mid shelf				
winter	8.85×10^{-16}	0	0	6.71×10^{-16}
spring	1.13×10^{-15}	0	0	8.15×10^{-16}
summer	1.35×10^{-15}	0	0	4.39×10^{-16}
fall	1.59×10^{-15}	0	0	3.44×10^{-16}
Shelf edge				
winter	2.21×10^{-15}	9.81×10^{-17}	3.99×10^{-16}	1.82×10^{-17}
spring	1.87×10^{-15}	1.53×10^{-16}	6.96×10^{-16}	1.69×10^{-17}
summer	2.46×10^{-15}	1.42×10^{-16}	4.97×10^{-16}	1.70×10^{-17}
fall	3.05×10^{-15}	2.66×10^{-16}	1.12×10^{-15}	1.69×10^{-17}
Continental slope				
winter	1.78×10^{-15}	1.06×10^{-16}	1.70×10^{-15}	0
spring	1.78×10^{-15}	1.06×10^{-16}	1.70×10^{-15}	0
summer	1.78×10^{-15}	1.06×10^{-16}	1.70×10^{-15}	0
fall	1.78×10^{-15}	1.06×10^{-16}	1.70×10^{-15}	0

Table 4.5-2
Probability of Impact for Marine Mammals and Sea Turtles in the Key West Complex Region

Occurrence	Small marine mammals (<10 ft long)	Medium marine mammals (10-33 ft long)	Large marine mammals (>33 ft long)	Sea turtles
Nearshore				
winter	1.01×10^{-15}	0	0	1.39×10^{-15}
spring	7.54×10^{-16}	0	0	1.37×10^{-15}
summer	5.09×10^{-16}	0	0	1.23×10^{-15}
fall	1.01×10^{-15}	0	0	1.18×10^{-15}
Mid shelf				
winter	1.08×10^{-15}	0	0	9.98×10^{-16}
spring	9.36×10^{-16}	0	0	1.06×10^{-15}
summer	1.04×10^{-15}	0	0	8.41×10^{-16}
fall	1.20×10^{-15}	0	0	8.57×10^{-16}
Shelf edge				
winter	2.72×10^{-15}	4.18×10^{-17}	6.34×10^{-16}	1.64×10^{-17}
spring	2.09×10^{-15}	4.18×10^{-17}	6.34×10^{-16}	1.36×10^{-16}
summer	2.32×10^{-15}	4.18×10^{-17}	6.34×10^{-16}	1.48×10^{-17}
fall	2.50×10^{-15}	4.18×10^{-17}	6.34×10^{-16}	6.23×10^{-17}
Continental slope				
winter	1.38×10^{-15}	2.16×10^{-16}	1.55×10^{-15}	0
spring	1.38×10^{-15}	2.16×10^{-16}	1.55×10^{-15}	0
summer	1.38×10^{-15}	2.16×10^{-16}	1.55×10^{-15}	0
fall	1.37×10^{-15}	2.16×10^{-16}	1.55×10^{-15}	0

Table 4.5-3
Probability of Impact for Marine Mammals and Sea Turtles in the Jacksonville/Charleston Operations Area

Occurrence	Small marine mammals (<10 ft long)	Medium marine mammals (0-33 ft long)	Large marine mammals (>33 ft long)	Sea turtles
On-shelf depth zone[1]				
winter	8.26×10^{-15}	0	8.49×10^{-16}	2.27×10^{-15}
spring	9.13×10^{-15}	0	4.25×10^{-16}	6.99×10^{-15}
summer	8.74×10^{-15}	0	0	5.87×10^{-15}
fall	7.68×10^{-15}	0	4.25×10^{-16}	2.10×10^{-15}
Off-shelf depth zone[2]				
winter	8.17×10^{-16}	2.94×10^{-15}	1.56×10^{-14}	1.19×10^{-16}
spring	1.49×10^{-15}	2.92×10^{-15}	0	1.01×10^{-16}
summer	4.10×10^{-15}	3.50×10^{-15}	0	2.38×10^{-16}
fall	2.16×10^{-15}	2.94×10^{-15}	0	7.32×10^{-17}

Notes: 1. Due to physiographic similarities, the on-shelf depth zone includes nearshore and mid shelf.
2. Due to physiographic similarities, the off-shelf depth zone includes shelf edge and continental slope.

It is Navy policy to protect marine mammals and sea turtles during operations (OPNAVINST 5090.1B, Subchapter 19-11.3). Collisions with marine mammals and sea turtles by Navy vessels are and would continue to be avoided, both within *and outside territorial waters*, by use of the following measures:

- The critical habitat used by the North Atlantic right whale (see Figure 3.1-1) would continue to be monitored by Navy airships to coordinate vessel movements to avoid whales (DENIX Ocean and Coasts, Website, Accessed July 2002).

- All surface vessels would have two lookouts with binoculars. The duty of the lookouts would be to watch for and report to the Officer of the Deck all things in the water with which the vessel may collide, including marine mammals, sea turtles, and *Sargassum* rafts.

- Naval vessels would avoid approaching any whale head on and would maneuver to keep at least 500 yards (457 m) away from any observed whale.

- Naval vessels would be alert at all times, using extreme caution, and proceeding at a "safe speed" so that the vessel (1) could take proper and effective action to avoid a collision with a whale, other marine mammal, or other federally listed species; and (2) could be stopped within a distance appropriate to the prevailing circumstances and conditions.

Qualification standards for lookouts include training on marine mammals and other sea life. Lookouts are trained to stay alert to any objects in the water so that collisions may be avoided. Through adherence to the above operational guidance, ship movements would have little impact on sea turtles or marine mammals.

To determine noise impacts to marine mammals during the launch phase of TLAM flight tests, consideration is given to what is known about criteria and thresholds for potential injury and estimations of noise levels during the launch phase. For impulsive noise in water, the Navy has previously evaluated criteria and thresholds for the potential injury and harassment of marine mammals and other protected marine species. The Navy's evaluations of criteria and thresholds have been based on experiments, actual measurements, and scientific theories for explosive noise. Evaluations have been developed in cooperation with the medical community, wildlife biologists, and acousticians in government and academia. Although acoustic impact evaluation applications for marine species are relatively new, with data still emerging on sensitivity, there still exists developing literature and public record on applications to marine species, and the Navy is leading the development of threshold criteria.

Noise levels generated by a TLAM missile launch are estimated to be 129 dBP near the launch site and about 115.5 to 120.5 dBP within a few hundred feet from the launch (see Subchapter 4.4.1). Noise injures marine mammals when there is a destruction or loss of tissue. To determine the extent of a noise injury, auditory threshold shifts are used to distinguish between noise levels that cause temporary threshold shifts and permanent threshold shifts. The threshold shift refers to a decrease in hearing sensitivity as measured by behavioral responses or extrapolated from physiological measures. A decrease in hearing sensitivity is recovered in a temporary threshold shift but is permanent to some degree in the permanent threshold shift. Thresholds currently used to assess noise impacts to marine mammals are 195 dB for a temporary threshold shift and 215 for a permanent threshold shift. Noise levels from a TLAM launch (129 dB) are well below the temporary threshold shift for marine mammals (195 dB). Noise generated from implementing the No Action Alternative would have no affect on marine mammals.

Unlike marine mammals, little is known about the role of sound and hearing in sea turtles. Although they can hear low frequency sound, such as that generated by gun blasts, there is limited information on sea turtle behavioral and physiological responses to low frequency sound underwater (Eckert, 1998, in DoN, January 2001).

In the few studies of low frequency hearing in sea turtle species, individuals showed low sensitivity. Lenhardt (1994; in DoN, January 2001), in an unpublished presentation, suggested that maximum sensitivity in sea turtles occurred between 100 and 800 Hz. Ridgway et al. (1969) found 300 to 400 Hz as the maximum sensitivity for green turtles, with a rapid decline in sensitivity for lower and higher signals. This study did not measure hearing capabilities in terms of behavioral responses, as has been done for sharks and other fish, but directly measured responses from the ear. While such studies are useful in giving a general indication of sensitivity of the ear to sounds (to both intensity levels and frequency ranges), they generally give only a limited picture of the actual hearing capabilities of an animal.

The effects of sound pressure levels on the hearing of sea turtles are unknown. Other analyses have used a conservative level of 160 dB for defining the potential effect on sea turtles, but based on the few studies to date, this represents a level that is probably lower than the actual sensitivity level of these species. Because noise levels generated by the launch are estimated to be 129 dBP near the launch site and about 115.5 to 120.5 dBP within a few hundred feet from the launch (see Subchapter 4.4.1), therefore there would be no affect to sea turtles from noise.

Since the number of TLAM flight tests would be low (12 or fewer per year) and mitigation measure outlined in Section 4.5 would be implemented, vessel collisions with marine mammals and sea turtles would be avoided.

Birds

The No Action Alternative would cause slight, if any, disturbance to marine birds in the Gulf of Mexico, Straits of Florida, and Atlantic Ocean and to terrestrial birds below IRs and near Eglin AFB Test Area B-70. Although many marine birds feed offshore, most of them nest and roost on shore. *The TLAM flight tests may temporarily disrupt the offshore feeding behaviors of marine birds. This disruption would not be considered significant because the duration of the launch would be short (less than one minute), launch locations would be spread out over the Gulf and Atlantic, a flyover event as experienced in one place on the ground during the cruise phase would be short (about 21 seconds), and flight tests would be infrequent (12 or fewer per year).*

Flocks of migratory birds are tracked by Department of Defense radar to provide information about their numbers, general direction of flight, and altitude. This radar system allows military flight planners to avoid collisions between birds and aircraft and minimize adverse impacts not only to migratory birds but to aircraft and pilots as well (DENIX DoD Aircrew Environmental Awareness Website, accessed July 2002).

Terrestrial avian habitat below IRs would be largely unaffected by the cruise phase of TLAM flight-testing because overflights occur at altitudes high enough to prevent significant disturbances from noise levels. When the missile and chase aircraft enter the restricted area of Eglin AFB B-70 Test Area, they may drop as low as 500 ft (152 m) above ground level with a corresponding noise level of 106 dBA. This 106-dBA noise level barely exceeds the threshold for low risk of noise complaints, which occurs in the 105-to 115-dBA range (see Subchapter 4.4.1). Many missile flight tests would end with a parachute landing in which the missile would climb to an altitude of 3,000 ft (914 m) above ground before the engine shuts off and the parachute deploys.

While feeding or nesting behaviors of birds in the vicinity of Eglin AFB Test Area B-70 may be disrupted by the No Action Alternative, bird populations would not be seriously affected. This is because exposure to noise levels from the missile termination would not be significant, flight test frequency would be low (12 or less per year), and the duration of disturbance from the missile termination would be short. Recovery of missile debris would be consistent with other types of ongoing range management activities. Impacts to marine and terrestrial birds resulting from the No Action Alternative would not be significant.

Terrestrial Mammals, Amphibians and Reptiles

Terrestrial mammals, amphibians, and reptiles below IRs and at Eglin AFB B-70 Test Area would continue to be subjected to minor impacts from the No Action Alternative. Because the cruise phase of the flight test involves air operations only, the cruise phase of TLAM testing would cause no direct impacts to terrestrial animals or habitat. The TLAM and chase aircraft would normally fly through IRs at an altitude of about 2,500 ft (762 km) above ground level, which is high enough to prevent significant noise disturbances to animals (see Subchapter 4.4).

The termination phase of the flight has the potential to impact animals on the ground at the target sites. Wildlife at Eglin AFB Test Area B-70 is routinely disturbed by military weapons firing from various military testing and training exercises. Minor disturbances to mammals, amphibians, and reptiles from the No Action Alternative would be consistent with current levels of disturbance resulting from ongoing use of Eglin AFB Test Area B-70. The TLAM missiles used would contain inert warheads, and many flight tests would end with a parachute landing, lessening the impact to wildlife from the No Action Alternative.

The Eglin AFB natural resources program staff identified natural communities and critical habitat on base. Wildlife resources would continue to be managed by Eglin's Natural Resources Branch according to their integrated approach and principles of ecosystem management. Given the infrequency of flight tests (12 or fewer per year) and the active management of wildlife resources, impacts to terrestrial mammals, amphibians, and reptiles from the No Action Alternative would continue to be minor.

4.5.1.3 Essential Fish Habitat

TLAM flight tests would not significantly affect EFH. *Threats to offshore fish habitat generally include navigation, dumping, sand and mineral mining, oil and gas exploration, development, transportation, commercial and industrial activities, natural events and global change. The movement of Navy vessels and missile launches would not reduce the quality or quantity of EFH* occurring within *or outside* territorial waters.

The potential for adverse impacts to EFH, both within *and outside* territorial waters, from TLAM launches is minimal (see Subchapter 4.7.1). The TLAM flight tests would not cause any significant disturbance to the sea floor or seagrasses, which are important habitat for fish. Although a floating raft of *Sargassum* may be shifted, there would be no significant adverse impact to algae that provide valuable fish habitat. The disruption to habitat components that support feeding, resting, sheltering, reproduction, or migration of fish would be slight, if any.

4.5.1.4 Threatened and Endangered Species

As described in the following sections, the No Action Alternative would have no adverse effect on threatened or endangered species inhabiting both territorial *and non-territorial* waters in the Gulf of Mexico, Straits of Florida, Atlantic Ocean, IRs, or Eglin AFB B-70 Test Area. Goals outlined in the *Integrated Natural Resources Draft Transitional Plan,* that provides a framework for protected species management within the guidelines of ecosystem management, would continue to be pursued.

The Air Armament Center Environmental Management Natural Resources Branch wildlife biologists have determined that the No Action Alternative will have no effect on threatened or endangered species. It is consistent with actions assessed in the Test Area B-70 Programmatic Environmental Assessment, and utilizes the existing test range frequently utilized for missions of this nature. Therefore, an Endangered Species Act Section 7 consultation would not be required.

Protected Plants

Potential impacts to protected plants would be negligible and similar to impacts expected for vegetation as described in Subchapter 4.5.1.1. Protected plants within 0.6 mi (one km) of Eglin AFB Test Area B-70 are usually found within the sandhills ecological association. Almost all of Eglin AFB Test Area B-70 is open grassland/shrubland ecological association, which occurs within disturbed sandhill ecological association areas (USAF, March 1998a). Disturbance to vegetation from routine range maintenance and other military training activity would continue to occur, whether or not the TLAM testing continues at Eglin AFB.

Protected Fish

Analysis in Subchapter 4.5.1.3 concludes that implementation of the No Action Alternative would not impact fish and fishery productivity. This analysis also extends to protected fish. The two protected fish species in the No Action Alternative project area are found in the Gulf of Mexico: the federally-threatened Gulf sturgeon and the saltmarsh topminnow, a state species of special concern.

The Gulf sturgeon is an anadromous fish, reproducing in freshwater. Younger fish tend to stay in rivers and estuaries. Adult fish spend a good portion of the year in rivers, taking to estuarine and Gulf waters for three to four of the coolest months (USFWS Division of Endangered Species, website accessed August 2002). Critical habitat proposed for the Gulf sturgeon by USFWS and NMFS is located in Gulf rivers and tributaries and along the Gulf coast. Threats to Gulf sturgeon include dams (which prevent upstream spawning), dredging, spoil deposition, and removal of large woody debris from rivers that provides cover and refuge for fish (NMFS, Office of Protected Resources website, accessed August 2002).

The saltmarsh topminnow has a short life span (thought to be less than two years) and tends to live in salt marshes or brackish water but can survive in freshwater. The most serious threat faced by the saltmarsh minnow is habitat alteration (NMFS, Office of Protected Resources website updated January 2001).

Subchapter 4.5.1.3 describes impacts on EFH. *TLAM launch and cruise phases would not significantly affect fish habitat, including habitat important to the Gulf sturgeon and saltmarsh topminnow. Missile launches would not take place near shores where the most of the habitat for these protected fishes is located but would take place in open waters. The potential for adverse impacts to water quality from TLAM launches is not considered significant (see Subchapter 4.7.1).* No dam construction, dredging, spoil deposition, or other habitat alteration would occur as part of the No Action Alternative, and no adverse impacts to protected fish are anticipated.

Protected Sea Turtles and Marine Mammals

All of the sea turtles and marine mammals present in the project area are protected species. A discussion of potential impacts from the No Action Alternative to the five protected species of marine turtles (two federally threatened and three federally endangered) and six marine mammal species (all federally endangered) is presented in Subchapter 4.5.1.3. The TLAM flight tests would not impact critical habitat designated by the USFWS for the leatherback sea turtle – that habitat is in the U.S. Virgin Islands, outside the current TLAM testing area. Green and hawksbill

turtle critical habitats have been designated in Puerto Rico, also outside the project area. Critical habitat for the North Atlantic right whale is within the project area, but adverse impacts would be avoided through the monitoring and avoidance measures described in Subchapter 4.5.1.3. Manatee protection areas, designated by the USFWS, are concentrated along Florida rivers and shorelines and would not be impacted by TLAM launches as they take place in open water far from shore. The probability that manatees could be impacted by emergency terminations is negligible – most terminations are needed during launch or termination at the target, away from manatee habitat.

No impacts to protected species in offshore waters are expected from the No Action Alternative because of the low probability of direct strikes from a failed missile or jettisoned missile hardware combined with the infrequency of flight tests (12 times or fewer per year) and seasonality of migration habits of many protected species. Noise would not be excessive at launch sites and would not adversely impact protected species in offshore waters (see Subchapter 4.4). Benthic habitats in offshore waters would not be altered.

Protected Birds

Subchapter 4.5.1.3 describes the effects of the No Action Alternative on birds and bird habitat, including protected birds and their critical habitat. Protected birds listed in Tables 3.5-1 and 3.5-2 are known to use coastal environments; however, *TLAM launches would be conducted away from coastal areas.* Noise impacts from the cruise phase over coastal areas and IRs would not cause significant disturbances to protected birds.

No impacts to protected bird species in offshore waters are expected from the No Action Alternative because of the low probability of direct strikes from a failed missile or jettisoned missile hardware combined with the infrequency of flight tests (12 times or fewer per year) and seasonality of many species. Noise would not be excessive at launch sites and would not adversely impact protected species in offshore waters (see Subchapter 4.4).

Protected birds at or near Eglin AFB Test Area B-70, as listed in Table 3.5-6, would not be adversely affected by the No Action Alternative. Noise impacts would not be significant, and many of the planned tests would terminate with a parachute landing. For the small number of TLAM flight tests terminating with a hard impact, the potential for a protected bird to be struck by a missile or shrapnel is extremely remote. As discussed in Subchapter 4.5.1.1, any risk of a TLAM termination igniting a wildfire outside a target or emergency termination area would be low. The TLAM Program has developed fire response procedures as part of the development of missile recovery procedures, including coordination with large landholders (such as the US Forest Service) along the test flight route.

Some protected bird species are only occasional visitors to Eglin AFB, and the probability for their presence to coincide with a hard TLAM impact is very small. Resident protected birds have habitat far away from the Eglin AFB Test Area B-70 targets. Targets within the Eglin AFB Test Area B-70 are positioned close to the centerline of the range. Foraging areas for the red-cockaded woodpecker are located along the fringes of the test area, and a few cavity trees are farther away from the targets, closer to the test area's southern boundary.

An exception to the above is the Florida burrowing owl (*Speotyto cunicularia floridana*a), a state species of special concern whose burrows are located in the central portion of the test area, closer to the targets. The probability for a direct impact to a burrowing owl from a missile or shrapnel would be extremely small as most test flights would end with a parachute landing. Burrowing owls would be more likely to be impacted from vehicular traffic collapsing their burrows. Vehicles used during a TLAM missile termination phase would remain on established roadways to avoid burrow collapse. Any disturbances would be offset by the vegetation maintenance conducted at the test area, which is directly responsible for providing the grassy habitat needed by burrowing owls.

Eglin AFB's Natural Resource Branch actively manages wildlife resources through the integration of military training with principles of ecosystem management. Continued TLAM flight tests are not expected to reduce protected bird populations or degrade their habitat because planned flight tests would occur 12 times or fewer per year, most TLAM missile terminations would end with parachute landings, and Eglin AFB natural resources staff actively manage these resources to minimize impacts from range activities.

Protected Terrestrial Mammals, Amphibians, and Reptiles

Potential impacts to protected mammals, amphibians, and reptiles listed in Table 3.5-6 would be similar to impacts expected for mammals, amphibians, and reptiles as described in Subchapter 4.5.1.3. Active gopher tortoise burrows and inactive gopher tortoise burrows within Eglin AFB Test Area B-70 are unlikely to be collapsed by missile terminations. Inactive burrows are used by several sensitive species including the dusky gopher frog, indigo snake, and Florida pine snake. Given the accuracy of guided missile terminations at intended target areas, no adverse effect to protected species is expected. The TLAM missiles used would contain inert warheads, and many flight tests would end with a parachute landing lessening the potential for impact to protected terrestrial species from the No Action Alternative.

4.5.2 Proposed Action

The Proposed Action would include impacts to biological resources identified for all areas as described under the No Action Alternative and as described below at Eglin AFB Test Areas B-75, C-52, and C-72. Another difference between the Proposed Action and the No Action Alternative would be the additional testing of the TLAM-E variant under the Proposed Action. The TLAM-E does not have a parachute recovery module and, therefore, would result in a hard landing.

No new facility construction would be required to support the Proposed Action. No new roads or road improvements would be required. Test teams would use existing access roads. Planned flight tests would terminate on previously-disturbed sites that are currently used for similar testing.

Implementation of the Proposed Action could cause slight impacts to biological resources similar to the No Action Alternative.

4.5.2.1 Vegetation

The Proposed Action would have little effect, if any, on vegetation (algae and seagrasses) in the Atlantic Ocean or Gulf of Mexico, either within *or outside of territorial waters*. As with the No Action Alternative, *Sargassum* algae in offshore waters would be purposefully avoided but could be shifted by movement of Navy vessels. Seagrasses rooted in the seabed occur closer to shore away from launch areas and would not be impacted. Indirect impacts of concern to aquatic vegetation, such as reduction in water quality, would not be caused by the movement of Navy vessels or TLAM launches.

There would be no impact to terrestrial vegetation because the cruise phase of the flight test involves air operations only. Terrestrial vegetation at the Eglin AFB Test Areas B-75, C-52, and C-72 is managed in a similar fashion to that of Test Area B-70, open grassland/shrubland maintained using mechanical methods or fire.

During missile termination, impacts to vegetation at test and target areas would be limited to the hazard footprint (see Subchapter 2.1.2.3). Disturbance to terrestrial vegetation at Eglin AFB Test Areas B-75, C-52, and C-72 from the Proposed Action would be consistent with ongoing disturbances resulting from the use and maintenance of test and target areas. Impacts to marine, terrestrial, and marsh vegetation from the Proposed Action would not be significant.

4.5.2.2 Wildlife

Shellfish and Finfish

Fishery resources in the warning areas, both within *and outside of territorial waters*, are and would continue to be carefully managed by the South Atlantic and Gulf of Mexico Fishery Management Councils to prevent overfishing. *Movement of Navy vessels in and out of launch sites and the TLAM launches would not compromise fishery productivity.*

Avoidance behavior by fish in response to Navy vessel movement would be temporary and similar to that caused by other boat traffic in the area. No loss or degradation of fish habitat would result from the Proposed Action either within *or outside* of territorial waters. EFH is discussed in Subchapter 4.5.2.4. No adverse impacts to shellfish and finfish resources underlying warning areas would occur from the Proposed Action.

Sea Turtles and Marine Mammals

The potential impacts – the potential for physical effects as a result of jettisoned missile hardware dropping into the water or a failed missile, the potential for collisions with ships, and the potential effects of TLAM launch noise – on sea turtles or marine mammals in either territorial *or non-territorial* waters from the Proposed Action are similar to those from the No Action Alternative.

Under the Proposed Action, the Navy would continue to follow policies outlined in Subchapter 4.5.1.3 to protect marine mammals during operations in mid-Atlantic and Gulf of Mexico territorial *and non-territorial* waters. Collisions with marine mammals and sea turtles by Navy vessels would be avoided through adherence to the operational guidance. Ship movements would not affect sea turtles or marine mammals.

Birds

The Proposed Action could cause slight disturbances to marine birds in the Atlantic Ocean and to terrestrial birds at the Eglin test areas. *Although TLAM flight tests may temporarily disrupt the offshore feeding behaviors of marine birds, this disruption would be minor because the duration of the launch would be short (less than one minute), launch locations would be spread out over the warning areas, a flyover event as experienced in one place on the ground during the cruise phase would be of short duration (about 21 seconds), and flight tests would be infrequent (fewer than 12 per year).* Chase aircraft would use information on flocks of migratory birds tracked by DoD radar to avoid collisions with them.

Birds at the Eglin test areas may be disturbed by noise when the missile and chase aircraft enter restricted areas, as low as 500 ft (152 m) above ground level, with a corresponding noise level of 106 dBA. Noise impacts to birds would not be significant because the 106-dBA noise level barely exceeds the threshold for low risk of noise complaints, which occurs in the 105- to 115-dBA range (see Subchapter 4.4.1).

While feeding or nesting behaviors of birds at the Eglin test areas may be disrupted by the Proposed Action, bird populations would not be seriously affected. This is because exposure to noise levels from the missile termination would not be significant, flight test frequency would be low (fewer than 12 per year), and the duration of disturbance from the missile termination would be short. Impacts to birds resulting from the Proposed Action would be minor.

Terrestrial Mammals, Amphibians, and Reptiles

Target sites at Eglin AFB Test Areas B-75, C-52, and C-72 have been used extensively for military testing. Areas surrounding these targets are heavily disturbed, have little vegetative cover, and contain minimal habitat and foraging opportunities for wildlife. Wildlife at the Eglin test areas are routinely disturbed by military weapons firing. Minor disturbances to mammals, amphibians, and reptiles from the Proposed Action would be consistent with current levels of disturbance, which occur from ongoing use of the test areas.

Debris from all TLAM variants landing in the Eglin test areas during missile termination would be small in size and quantity and not likely to adversely impact terrestrial wildlife. Debris would be periodically removed from test areas in accordance with standard operating procedures.

Wildlife resources would continue to be managed by Eglin's Natural Resource Branch. This active management of wildlife resources and the infrequency of flight tests (12 or fewer per year) all lead to minor impacts to terrestrial mammals, amphibians, and reptiles from the Proposed Action.

4.5.2.3 Essential Fish Habitat

Because the launch areas are the same for the Proposed Action as they are for the No Action Alternative, the Proposed Action would not result in any additional impacts to essential fish habitat either within *or outside of* territorial waters.

4.5.2.4 Threatened and Endangered Species

The Air Armament Center Environmental Management Natural Resources Branch wildlife biologists have determined that the Proposed Action would have no effect on threatened or endangered species. The Proposed Action is consistent with actions assessed in the Test Area B-70, B-75, C-52, and C-72 Programmatic Environmental Assessments, and utilizes the existing test ranges frequently utilized for missions of this nature. Therefore, an Endangered Species Act Section 7 consultation would not be required.

Protected Plants

Potential impacts to protected plants at Eglin AFB Test Areas B-75, C-52, and C-72 would be similar to impacts expected for vegetation as described in Subchapter 4.5.2.1. Disturbance to vegetation from routine range maintenance and other military training activities would continue to occur. Any disturbance to protected plants from the Proposed Action would be minor and consistent with current levels of disturbance resulting from ongoing use of the test areas.

Protected Fish

The Proposed Action would not impact the federally-endangered Okaloosa darter, which is found in streams within 0.6 mi (one km) of Eglin AFB Test Areas C-52 and C-72. No impacts would occur to the darter because target areas are not in or near streams, no direct strikes from missiles or debris are anticipated, and its habitat would not be altered.

Protected Sea Turtles and Marine Mammals

Because the launch areas are the same for the Proposed Action as they are for the No Action Alternative, the Proposed Action would not result in any impacts on protected sea turtles and marine mammals.

Protected Birds

As discussed earlier in Subchapter 4.5.2.3, the Proposed Action would not significantly affect birds or bird habitat. Protected birds at Eglin AFB Test Areas B-75, C-52, and C-72, as listed in Table 3.5-6, would not be subjected to significant noise levels. Many of the TLAM flight tests would end with a parachute landing. For the flight tests ending with a hard impact, there is the slight potential for a protected bird to be struck by a missile or shrapnel. However, some of the protected birds are only occasional visitors to Eglin, and the probability for their presence to coincide with a hard TLAM impact is extremely remote.

Year-round resident protected birds, like the red-cockaded woodpecker and Florida burrowing owl, are unlikely to be impacted. Red-cockaded woodpecker foraging areas are located along the fringes of the test areas while targets are generally in interior portions of the test areas. Although burrowing owls are often located throughout test areas, they are more likely to be impacted by vehicular traffic. Vehicles used during TLAM flight terminations and recovery would remain on established roadways to avoid burrow collapse. Eglin AFB's active management of wildlife resources would continue to provide monitoring for the status of protected species so that protected birds populations and their habitats would not be reduced or degraded, respectively.

The Proposed Action would not adversely affect protected birds at Eglin AFB Test Areas B-75, C-52, and C-72.

Protected Terrestrial Mammals, Amphibians, and Reptiles

Potential impacts to protected mammals, amphibians, and reptiles listed in Table 3.5-6 at Eglin AFB Test Areas B-75, C-52, and C-72 would be similar to impacts expected for terrestrial animals described in Subchapter 4.5.2.3. TLAM missile terminations at the Eglin test areas are unlikely to collapse active or inactive gopher tortoise burrows because most flight tests would end with a parachute landing. It is very unlikely that protected terrestrial animals would be impacted by flight tests ending with a hard impact because those impacts would be spread out over four test areas and guided missiles have a high level of precision for termination at intended targets within test areas. No adverse effect to protected terrestrial animal species is expected from the Proposed Action.

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4.6 Cultural Resources

The National Historic Preservation Act (NHPA) of 1966 and subsequent amendments were passed to provide for the protection, enhancement, and preservation of any property that possesses significant archaeological, architectural, historical, or cultural characteristics. EO 11593 of 1974 further defined the obligations of federal agencies concerning the NHPA.

4.6.1 No Action Alternative

The No Action Alternative occurs over submerged lands and land areas. *Submerged areas underlie the EWTAs and associated warning areas, the warning areas east of Jacksonville, Florida,* the ADIZ *and warning areas near Miami*, the southern endpoint of IR-030/031, both endpoints of IR-032/033, and the southeastern endpoint of IR-015. Land areas include land below IR-030/031, IR-032/033, and IR-015 and Test Area B-70 at Eglin AFB.

4.6.1.1 Submerged Areas

Historic shipwrecks and submerged archaeological sites are usually found along the shorelines. *Because launches are conducted in open water, generally far from shore, ships and submarines involved in TLAM flight tests do not affect submerged cultural resources during the launch phase. Additionally, no impact to submerged cultural resources currently occurs or would occur from the routine movement of ships or submarines into TLAM launch areas – vessels' movements do not disturb the sea floor, and vessels do not anchor in these areas. Anchor damage to submerged cultural resources is more likely to be caused by visiting dive boats.*

Similarly, the missile hardware jettisoned during the launch phase is unlikely to impact submerged cultural resources. All jettisoned missile hardware is discarded within the launch hazard pattern (as described in Subchapter 2.1.2.1). Launch hazard patterns are located outside sensitive areas such as the Florida Keys National Marine Sanctuary, the Tarpon UAP or the City of Hawkinsville UAP.

Emergency terminations are also unlikely to impact cultural resources in submerged areas. The TLAM is most likely to experience failure during the launch phase, away from sensitive resources. In the last five years, from 1998 to 2004, four flights have been terminated early, all in designated recovery areas. Three of the flights were terminated due to missile instrumentation problems, which prevented landfall and continuation of the mission. The fourth flight was terminated as a result of a missile sub-system failure over land. The missile was successfully flown to a designated recovery area on a test range and was recovered nominally.

4.6.1.2 Land Areas

Because the missile cruise phase of the flight test involves air operations only and no ground-disturbing activities, there would be no impacts to cultural resources located under IRs. Few, if any, noise impacts to cultural resources on land would occur because peak noise levels for a TLAM flight test are not excessive. The highest noise levels that are anticipated to occur directly

beneath the flight track (within the IRs) would be 101.3 dBA caused by the F/A-18 E/F jet at ground level (Southwest Division, NAVFACENGCOM, October 1998) and would be very brief. This level just exceeds the levels considered to generate noise complaints. An F/A-18 E/F could cause levels as high as 116.0 dBA at ground level, but these levels would be experienced only at the target areas.

The likelihood for land-based cultural resources to be impacted by a missile failure is extremely small because the probability of missile failure during cruise phase is very small (2.6 percent), and the probability that this failure would occur over a resource is even smaller.

Land-disturbing activities associated with the No Action Alternative would be limited to impacts from missile termination at Eglin AFB Test Area B-70. This type of impact is consistent with ongoing use of the test area. Vehicles used at the test area stay on established roads to the greatest extent possible. There are no identified Areas of Cultural Concern within Test Area B-70. Thus, no impacts to cultural resources on land would result from the missile termination phase of TLAM testing (US Navy, 1996f in Southwest Division, NAVFACENGCOM, October 1998).

Tomahawk test flights would not cause any adverse effects to cultural resources.

4.6.2 Proposed Action

All areas described under the No Action Alternative are included in the Proposed Action. Descriptions of impacts to cultural resources within those areas (Subchapter 4.6.1) apply to the Proposed Action, as well. The remaining discussion of impacts to cultural resources applies to the additional areas included in the Proposed Action– the established Eglin AFB ranges at Test Areas B-75, C-52, and C-72.

Land-disturbing activities associated with the Proposed Action would be limited to impacts from missile termination at Eglin AFB Test Areas B-75, C-52, and C-72. There are no Areas of Cultural Concern within Test Area B-75. Six Areas of Cultural Concern are in Test Area C-52, and two Areas of Cultural Concern are wholly or partially in Test Area C-72. However, specific cultural resources are not present at targets within the C-52 and C-72 Test Areas. Since Test Areas B-75, C-52, and C-72 are established ranges, normal missile termination would likely have impacts consistent with ongoing use of these areas. A missile recovery plan, already in place, would be followed when recovering missile debris to avoid inadvertent effects on cultural resources (US Navy, 1996). The cultural data at Eglin AFB are updated regularly; project managers should contact Eglin AFB cultural resources staff if they would be operating near or within an Area of Cultural Concern to avoid mission delay (Shreve, 2004) and minimize the potential for adverse effect.

4.7 Water Resources

4.7.1 No Action Alternative

Implementation of the No Action Alternative would continue to have minimal direct and indirect effects on water resources. Water resources pertinent to the No Action Alternative include: the Gulf of Mexico along the Florida coast; Atlantic Ocean off the coasts of Jacksonville and Miami; rivers in Florida and Alabama below IRs; and streams within Eglin AFB Test Area B-70.

Ocean waters are subject to impacts from numerous sources: storm sewers, sewage treatment outfalls, overboard disposal of debris and sewage, oil spills, bilge discharges, and non-point source pollution (Council on Environmental Quality, 1995). Navy vessels routinely follow the Navy Environmental and Natural Resources Program Manual (OPNAVINST 5090.1B) requirements to minimize environmental impacts to water resources by appropriately handling hazardous materials, medical and dental waste, non-oily wastewater, oil and oily wastewater, and solid waste.

The missile hardware jettisoned during the launch phase is unlikely to contaminate or otherwise adversely affect water resources. The solid fuel booster rocket used to propel the missile contains approximately 304 lbs (137 kg) of fuel, but most of this is burned completely before the empty booster breaks away and falls into the sea. It is unlikely any solid fuel would remain in the rocket during an emergency termination. A malfunction of the booster could cause unburned solid fuel to be released into the ocean. The potential for adverse impacts to water resources at the launch site is not considered significant given the amount of solid fuel likely to remain in the rocket motor and the dilution potential of the ocean. (For comparison, the space shuttle uses over two million pounds of solid fuel propellant for its launch.)

During the missile cruise phase, the flight test involves air operations only. The probability for missile failure to occur during the cruise phase is 2.6 percent, and the probability that an emergency termination would impact freshwater resources in IRs underlying the flight route is much smaller. Generally, the test team would terminate the missile prior to making landfall if there appears to be a problem.

The TLAMs also carry 600 lbs (272 kg) of JP-10 jet fuel to power the turbofan engine. If the test team needs to make an emergency termination at the launch site, water resources would not be adversely impacted by jet fuel releases for those missiles equipped with parachutes. The intact missiles are presently, and would continue to be, recovered (see Subchapters 2.2.2 and 2.2.3). For those missiles not equipped with an REM (parachute recovery system), the fuel tank could rupture during an ocean impact, releasing jet fuel into the ocean. The Navy has identified root causes and implemented corrective actions to reduce the frequency of missile failures.

For normal terminations at target areas, the fuel is generally used up by the time the missile reaches the target, and little fuel is released, even during terminations of missiles not equipped with parachutes. For hard impacts during emergency terminations, the fuel tank could rupture and release fuel to surface or ground waters causing contamination. The potential for such an

occurrence is very low because of the low probability for missile failure. Also, the test team would deploy a spill response team to clean up any material at the termination site.

Jet fuel is less toxic than gasoline because it contains less benzene and none of the additives of gasoline. The environmental hazard from a spill of jet fuel is less than that from a similar spill of gasoline. Standard spill control and recovery measures are used if a fuel release occurs. These measures are designed to contain the fuel, limit the spread of the release, and clean up any residual fuel. If a small volume of fuel is released at sea, the appropriate response could be to take no action. Standard spill response measures for a fuel release on land include using containment devices, absorbent materials, and soil removal techniques (Southwest Division NAVFACENGCOM, October 1998).

The vessels, aircraft, vehicles, and generators deployed during a test all use fuel. It is possible but unlikely for any of these to release fuel into water resources. Equipment is routinely refueled without incident, and Navy personnel, as standard operating procedures, plan for and respond to hazardous substance releases in accordance with OPNAVINST 5090.1B.

The TLAM-N variants, with DU ballast, are equipped with parachutes to allow for a "soft impact" and missile recovery. In the event of an emergency termination over water, the risk of contamination of water resources from DU is low because:

- There is a very small probability for missile failure of TLAM-N variant.
- A parachute and missile recovery program exists.
- The DU is encapsulated in an oxidation resistant alloy and, therefore, is unlikely to be released into the environment.
- The physicochemical properties of the DU ballast itself reduce contamination potential (Subchapter 4.2).

Wetlands below IRs would remain unaffected by TLAM flight tests because the cruise phase involves air operations only. Target areas within the Eglin AFB Test Area B-70 are not typically located within wetlands. Where wetlands are located within the hazard footprint of a TLAM missile termination, impacts would be minor and consist of damage caused by direct impact from debris; there would be no discharge of dredged or fill material requiring a Section 404 CWA permit or changes to the hydrology that might cause more widespread damage.

4.7.2 Proposed Action

The Proposed Action would cause only minor impacts to water resources. All areas described under the No Action Alternative are included in the Proposed Action.

Impacts on water resources would otherwise be the same as described under Subchapter 4.7.1. Even though a new TLAM variant would be tested under the Proposed Action, the flight test

procedures would be the same, and therefore, the impacts analyses are comparable to the No Action Alternative.

The Proposed Action does not involve any construction or filling of wetland areas. Targets at the Eglin test areas are located within wetlands. Where wetlands are located within the hazard footprint of a TLAM missile termination, impacts would be minor and consist of damage caused by direct impact from debris; there would be no discharge of dredged or fill material requiring a Section 404 CWA permit or changes to the hydrology that might cause more widespread damage.

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4.8 Environmental Justice

Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires consideration of whether the Proposed Action would disproportionately affect minority or low-income groups. Guidance provided by the Council on Environmental Quality (CEQ 1997) and USEPA (1998) has been considered in developing this analysis.

Also addressed in this section, as required by EO 13045, is "Protection of Children from Environmental Health Risks." This EO was prompted by the recognition that children, still undergoing physiological growth and development, are more sensitive to adverse environmental health and safety risks than adults. Environmental health and safety risks refer to the risks attributable to products or substances that one is likely to come in contact with or ingest.

4.8.1 No Action Alternative

TLAM test flight routes, whether in restricted airspace or utilizing existing IRs, have been designed to avoid population centers. The range of the flight test route is extensive, and where the IRs abut populations, the populations are very diverse – many ethnic and economic areas are traversed. As a result, there would be no disproportionately adverse environmental health or safety impacts to minority or low-income populations if the No Action Alternative is implemented. In addition, impacts such as noise are now and would continue to be minor, so the No Action Alternative presents no adverse environmental health and safety risks to children.

4.8.2 Proposed Action

As for the No Action Alternative, the Proposed Action would not have disproportionate impacts on minority or low-income populations, nor adverse health or safety impacts on populations of children.

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4.9 Cumulative Impacts

Cumulative impacts have been defined by the Council on Environmental Quality (CEQ) in 40 CFR 1508.7 as:

> "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR § 1508.7)

The CEQ regulations further require that NEPA environmental analyses address connected, cumulative, and similar actions in the same document (40 CFR 1508.25). This requirement prohibits segmentation of a project into smaller components to avoid required environmental analysis.

4.9.1 No Action Alternative

The No Action Alternative consists of continuing ongoing testing and training in the operation of current variants of the TLAM. This EA/OEA has evaluated information relevant to environmental concerns associated with the No Action Alternative. The analyses conclude that implementation of the No Action Alternative would cause no significant environmental impacts.

Many other activities occur within territorial *and non-territorial* waters within the project area (see Subchapter 3.1) for current east coast TLAM testing. These include:

- Commercial and recreational fishing.
- Commercial shipping.
- Recreational boating.
- Oil and gas exploration, development, and production operations (mainly in the Gulf of Mexico).
- Military equipment and weapons testing.
- Military vessel training missions.
- Military training on land.
- Military aircraft training maneuvers within designated airspace over water and land.
- Land and transportation development.

These other activities impact many of the same areas and environmental features as the East Coast TLAM testing, but they vary in frequency, duration, and location. Often the impacts resulting from these other activities do not tend to be concentrated in any one area but are spread over many areas. The ongoing testing and training have caused a minor cumulative impact in combination with these activities.

4.9.2 Proposed Action

The Proposed Action would contribute similarly to cumulative impacts within both territorial *and non-territorial* waters. The impacts of the Proposed Action, when added to the impacts of other past, present, and reasonable foreseeable future actions, would not cause any significant cumulative impact to any resources. This is due to the low frequency of testing and the proposed use of established military targets. The Proposed Action would not increase the TLAM flight test frequency, and the Eglin AFB test areas are managed for range impact operations.

4.10 Unavoidable Adverse Impacts

Based on the analysis in this EA/OEA, the only impact would be minor temporary noise from the TLAM, aircraft, and other test equipment, and minor impacts on soils and vegetation during hard missile impacts. Exposure of any person or animal to noise from the TLAM would be brief (about 21 seconds) and sporadic (no more than 12 times per year). Impacts to soils and vegetation would generally occur at established Eglin AFB targets, which are already subject to such impacts from other weapons testing programs, or at emergency termination areas that have been prepared for such a termination. The Navy and/or Air Force would take appropriate measures to restore soils and vegetation after each hard impact.

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4.11 Relationship Between Local Short-term Uses of the Environment and the Enhancement of Long-term Productivity

Short-term uses of the environment are those that occur over a period shorter than the life of the Proposed Action. Long-term uses include those impacts that would persist for a period of five years or more, or for the life of the Proposed Action.

4.11.1 No Action Alternative

The No Action Alternative represents a short-term use of the environment, in both territorial *and non-territorial* waters. It has a negligible impact on other, longer-term uses, such as use of the ocean's natural resources or use of the Eglin AFB Test Area B-70 for ongoing training activities.

4.11.2 Proposed Action

The Proposed Action also represents a short-term use of the environment, in both territorial *and non-territorial* waters. Long-term uses would be impacted inconsequentially by the TLAM flight tests under the Proposed Action.

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4.12 Irreversible and Irretrievable Commitments of Resources

4.12.1 No Action Alternative

The No Action Alternative maintains the current TLAM flight testing frequency of up to 12 flight tests per year. Either a ship or submarine is used as the launch vessel. If the launch vessel is a submarine, a launch area support ship is used in conjunction with the submarine. As many as seven aircraft and a number of motor vehicles are involved in a TLAM flight test. As many as 20 generators could be used to supply energy for photographic and video recording equipment. Personnel effort is involved in all phases of the TLAM testing. Energy, fuel, missiles, and labor are expended for each TLAM test. Some missiles, like the TLAM-C and TLAM-N, are reusable due to their parachute recovery modules.

4.12.2 Proposed Action

The Proposed Action would lead to no additional commitment of irreversible and irretrievable resources because the testing frequency would be similar to that of the No Action Alternative, up to 12 flights per year. Labor and missiles expended under the Proposed Action would be comparable to the No Action Alternative.

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5 LIST OF PREPARERS

This Environmental Assessment was prepared by :

TAMS CONSULTANTS, INC., AN EARTH TECH COMPANY
2101 Wilson Boulevard, Suite 300
Arlington, Virginia 22201

Key personnel included:

LAURENT CARTAYRADE, CULTURAL RESOURCES: 4 years of experience in environmental impact studies and 6 years of experience in cultural resources. University of Paris IV-Sorbonne, BA; University of Maryland-College Park, 1991, MA, History; 1997, PhD, History.

DAVID P. DERRIG, JR., AICP, URBAN PLANNER: 20 years of experience in environmental permitting, planning, impact analysis and transportation planning. Worcester Polytechnic Institute, 1980, BS, Urban Planning.

JULIA DOMINGUE, GIS ANALYSIS/CARTOGRAPHY: 23 years of experience in designing and implementing geographic information systems, cartography, and remote sensing applications for environmental impact studies. University of Illinois, 1975, BA, Geography; 1979, MS, Geography.

VICTOR P. FRANKENTHALER, ENVIRONMENTAL PLANNER: 23 years of experience in water, coastal and marine resource planning, field investigations, and preparation of environmental impact studies. Rutgers University, 1981, BS, Environmental Planning and Design; 1991, MS, Geography.

HARRIET NASH, MARINE BIOLOGIST/SUCCEEDING PROJECT MANAGER*: 5 years of experience in coastal and fishery management and preparation of environmental impact assessments. Georgetown University, 1995, BS, Biology; Duke University, 2001, MEM, Coastal Environmental Management.

JANET O'NEILL, INITIAL PROJECT MANAGER*: 26 years of experience in wetlands permitting, environmental field investigations, and preparation of environmental impact assessments. University of Massachusetts at Amherst, 1974, BS, Fisheries Biology; Tufts University, 1984, MS, Environmental Health Engineering.

KATHLEEN RIEK-MILLER, ENVIRONMENTAL PLANNER: 12 years experience in environmental impact assessment and natural resource planning. Indiana University of Pennsylvania, 1987, BS, Biology.

FANG YANG, AIR QUALITY AND NOISE: 11 years experience in preparing air quality portions of environmental impact statements for stationary and mobile source impacts. Fudan University, 1982, BS Physics; New York University, 1988, MS, Atmospheric Science.

Naval Facilities Engineering Command, Atlantic

KEITH JENKINS, MARINE RESOURCE SPECIALIST: 11 years related NEPA and Marine Science experience. Navy Technical Representative for this EA/OEA. BS Old dominion Univ. Marine Biology 1997; MS ODU Fisheries Oceanography 2001.

JIM SEYLER, ENVIRONMENTAL PLANNER: 11 years related NEPA and Natural Resources experience. Navy Technical Representative for this EA/OEA. BS Syracuse University 1995.

6 LIST OF AGENCIES AND PERSONS CONSULTED

The following agencies and persons have been consulted:

Doug Oliver, Florida Department of Environmental Protection, Office of Intergovernmental Programs.

Mary E. Tanner, Executive Office of the Governor of Florida, Office of Planning and Budgeting, Environmental Policy/Community & Economic Development Unit.

Florida Department of Community Affairs

Florida Department of Environmental Protection

Florida Fish and Wildlife Commission

Florida Department of State

Florida Department of Transportation

Northwest Florida Water Management District

St. Johns River Water Management District

Florida Office of Policy and Budget, Environmental Policy Unit

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8 ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
AAC	Air Armament Center
ac	Acre(s)
ACAMP	Alabama Coastal Area Management Plan
ADIZ	Air defense identification zone
AFB	Air Force Base
AFI	Air Force Instruction
AGL	Above ground level
AMFSO	Airborne missile flight safety officer
ARTCC	Air Route Traffic Control Center
ATAC	Advanced Tactical Air Command
BAR	Bureau of Archaeological Research (Florida)
CAMA	Coastal Area Management Act (North Carolina)
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	Centimeter(s)
CNEL	Community noise equivalent level
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	Decibel(s)
dBA	A-weighted decibel(s)
dBC	C-weighted decibel(s)
DoN	Department of the Navy
DSMAC	Digital scene matching area correlation
DU	Depleted uranium
EA	Environmental assessment
EEZ	Exclusive economic zone
EFH	Essential fish habitat
EO	Executive Order
EOD	Explosive ordnance disposal
ESA	Endangered Species Act
EWTA	Eglin Water Test Area
FAA	Federal Aviation Administration
FCMP	Florida Coastal Management Program
FDEP	Florida Department of Environmental Protection
FMP	Fishery Management Plan

Acronym/Abbreviation	Definition
FNAI	Florida Natural Areas Inventory
FREAC	Florida Resources and Environmental Resources Center
ft	Foot (feet)
GPS	Global positioning system
ha	Hectare(s)
in	Inch(es)
INRMP	Integrated natural resources management plan
IR	Instrument flight route
kg	Kilogram(s)
km	Kilometer(s)
LASS	Launch area support ship
LANTDIV	Atlantic Division
lb(s)	Pound(s)
L_{dn}	Day-night average noise level
m	Meter(s)
MAB	Mid-Atlantic Bight
MAEWR	Mid-Atlantic Electronic Warfare Range
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCO	Marine Corps Order
MFP	Mission Firing Plan
mg	Milligram(s)
mi	Mile(s)
MMPA	Marine Mammals Protection Act
MOA	Military operations area
MOI	Message of instruction
MOU	Memorandum of Understanding
MSL	Mean sea level
MTR	Military training route
NAAQS	National ambient air quality standards
NAS	Naval Air Station
NATC	Naval Air Test Center
NAVFACENGCOM	Naval Facilities Engineering Command
NAWCWD	Naval Air Warfare Center (Weapons Division)
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nmi	Nautical mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration

Acronym/Abbreviation	Definition
NOTAM	Notice to airmen
NOTMAR	Notice to mariners
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NRMPNWR	Natural resources management planNational Wildlife Refuge
OEA	Overseas environmental assessment
OPNAVINST	Chief of Naval Operations Instruction
OTL	Operational Test Launch
PEO(W)	Program Executive Officer for Strike Weapons and Unmanned Aviation
REM	Recovery module
RSS	Range safety system
SERE	Survival, escape, rescue, and evasion
SEL	Sound exposure level
SOUTHDIV	Southern Division
sq km	Square kilometer(s)
sq mi	Square mile(s)
sq nmi	Square nautical mile(s)
SUPSALV	Supervisor of Salvage and Diving
SWDIV	Southwest Division
TACTS	Tactical Aircrew Combat Training System
TASM	Tomahawk anti-ship missile
TERCOM	Terrain contour matching
TLAM	Tomahawk land attack missile
UAP	Underwater Archaeological Preserve
US	United States
USAF	United States Air Force
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UXO	Unexploded ordnance
VR	Visual flight route
W-xxx	Warning Area xxx

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APPENDIX A

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No Fly Areas

IR – 015	Radius
Medart	1 nm
Sopchoppy	1 nm
Crawfordville	1 nm
Shell Point	1 nm
Alpha	1 nm
Compass Lake	1.5 nm
Rock Hill	1 nm
Bristal	1 nm

IR – 30/31	Radius
Laurel Hill	1.5 nm
Blue Pond	1 nm
Oak Hill	1.5 nm
Pine Apple	1.5 nm
Vernonburg	1.5 nm
Blacksher	1.5 nm
Jack Springs	1 nm
Huxford	1 nm
McCullough	1 nm
Wallace	1 nm
Dixie	1 nm
Cohasset	1 nm
Nixonville	1 nm
Garland	1 nm
McWilliams	1 nm
Suggsville	1 nm
Manila	1 nm
Fairfield	1 nm
Svea	1 nm
Mossy Head	1 nm
Freeport	2 nm
Also, 10 industrial areas (7 gas farms, a poultry farm, Site C-6 (on Eglin AFB), and a substation)	All have a 1-nmi radius, except C-6, which has a 3.5-nmi radius

No Fly Areas
(Continued)

IR – 32/33	Radius
St. Augustine	5 nm
Green Cove Springs	3 nm
Reynolds	3 nm
Sampson	1 nm
Starke	3 nm
Lawtey	2 nm
Brooker	1 nm
Santa Fe	1 nm
La Cross	1 nm
Hampton	1 nm
Waldo	2 nm
Penny Farms	2 nm
Kingsley Lake	3 nm
Alachua	2 nm
High Springs	2 nm
Lake Butler	2 nm
Fort White	1.5 nm
Mayo	1 nm
Branford	2 nm
Perry	3 nm
Millcreek	1 nm
Florida State Prison	1.5 nm
Switzerland	1 nm
Fruit Cove	1 nm
Cedar Cove	1 nm
Dept. of Corrections	1.5 nm
Golf World	3 nm

APPENDIX B

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Table 1
Animal Species Found in the Florida Counties Underlying IR-15 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Taxon[1]	Federal[2]	State[2]	Counties
Ajaia ajaia	Roseate spoonbill	B		C	Wakulla Leon
Alligator mississippiensis[3]	American alligator[3]	R	T	C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Amblema neislerii	Fat threeridge	Mo	E		Liberty Gadsden Calhoun Jackson
Ambystoma cingulatum	Flatwoods salamander	A	T	C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Ammodramus maritimus peninsulae	Scott's seaside sparrow	B		C	Wakulla
Aramus guarauna	Limpkin	B		C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay
Caretta caretta	Loggerhead turtle	R	T	T	Wakulla Bay Walton
Charadrius alexandrinus	Snowy plover	B		T	Bay Walton
Charadrius Melodus	Piping plover	B	T	T	Bay Walton
Chelonia mydas	Green turtle	R	E	E	Wakulla Bay Walton
Cistothorus palustris griseus	Worthington's marsh wren	B		C	Wakulla
Dermochelys coriacea	Leatherback turtle	R	E	E	Wakulla Bay Walton
Drymarchon corais couperi	Eastern indigo snake	R	T	T	Wakulla Leon Liberty Gadsden Calhoun Jackson Washington Walton
Egretta caerulea	Little blue heron	B		C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Egretta rufescens	Reddish egret	B		C	Wakulla Bay Walton
Egretta thula	Snowy egret	B		C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Egretta tricolor	Tricolored heron	B		C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Elliptio chipolaensis	Chipola slabshell	Mo	T		Calhoun Jackson
Elliptoideus sloatianus	Purple bankclimber	Mo	T		Wakulla Leon Liberty Gadsden Calhoun Jackson
Etheostoma okaloosae	Okaloosa darter	F	E	E	Walton
Eudocimus albus	White ibis	B		C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Falco sparverius paulus	Southeastern American kestrel	B		T	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Gopherus polyphemus	Gopher tortoise	R		C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Graptemys barbouri	Barbour's map turtle	R		C	Leon Liberty Gadsden Calhoun Jackson Washington
Haematopus palliatus	American oystercatcher	B		C	Wakulla
Haideotriton wallacei	Georgia blind salamander	A		C	Jackson

Table 1
Animal Species Found in the Florida Counties Underlying IR-15 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Taxon[1]	Federal[2]	State[2]	Counties
Haliaeetus leucocephalus	Bald eagle	B	T	T	Wakulla Leon Liberty Gadsden Calhoun Jackson Washington Walton
Hyla andersonii	Pine barren treefrog	A		C	Walton
Lampsilis subangulata	Shiny rayed pocketbook	Mo	E		Leon Liberty Gadsden Calhoun Jackson
Lepidochelys kempii	Kemp's ridley	R	E	E	Wakulla Bay Walton
Macroclemys temminckii	Alligator snapping turtle	R		C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Medionidus penicillatus	Gulf moccasinshell	Mo	E		Calhoun Jackson Bay Walton
Medionidus simpsonianus	Ochlockonee moccasinshell	Mo	E		Wakulla Leon Liberty Gadsden
Micropterus cataractae	Shoal bass	F		C	Liberty Gadsden Calhoun Jackson
Micropterus notius	Suwannee bass	F		C	Wakulla Leon Liberty Gadsden
Mycteria americana	Wood stork	B	E	E	Wakulla Leon
Myotis grisescens	Gray bat	M	E	E	Jackson
Notropis melanostomus	Blackmouth shiner	F		E	Walton
Pandion haliaetus	Osprey	B		C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Pelecanus occidentalis	Brown pelican	B		C	Wakulla Bay Walton
Peromyscus polionotus allophrys	Choctawhatchee beach mouse	M	E	E	Bay Walton
Peromyscus polionotus peninsularis	St. Andrews beach mouse	M	E	E	Bay
Picoides Borealis	Red-cockaded woodpecker	B	E	T	Wakulla Leon Liberty Bay Walton
Pituophis melanoleucus mugitus	Florida pine snake	R		C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Pleurobema pyriforme	Oval pigtoe	Mo	E		Leon Gadsden Calhoun Jackson
Procambarus econfinae	Panama City crayfish	C		C	Bay
Pseudemys concinna suwanniensis	Suwannee cooter	R		C	Wakulla Leon Liberty Gadsden
Pteronotropis welaka	Bluenose shiner	F		C	Jackson Bay Washington Walton
Rana capito	Gopher frog	A		C	Wakulla Leon Liberty Gadsden Calhoun Jackson Bay Washington Walton
Rynchops niger	Black skimmer	B		C	Wakulla Bay Walton
Sterna antillarum	Least tern	B		T	Wakulla Leon Bay Walton
Tamias striatus	Eastern chipmunk	M		C	Walton
Trichechus manatus	Manatee	M	E	E	Wakulla
Ursus americanus floridanus	Florida black bear	M		T	Wakulla Leon Liberty Calhoun Bay Walton

Table 1
Animal Species Found in the Florida Counties Underlying IR-15 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Taxon[1]	Federal[2]	State[2]	Counties

Notes:

1. A = Amphibian
   B = Bird
   C = Crustacean
   F = Fish
   M = Mammal
   Mo = Mollusk
   R = Reptile

2. E = Endangered
   T = Threatened
   C = Not listed but of special concern

3. Listed because of its similarity with a threatened species from which it cannot be easily distinguished.

Source: Florida Natural Areas Inventory, 1990.

Table 2
Plant Species Found in the Florida Counties Underlying IR-15 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Federal[1]	State[1]	Counties
Asclepias viridula	Southern milkweed		T	Wakulla Liberty Bay Washington Walton
Asplenium monanthes	Single-sorus spleenwort		E	Jackson
Aster spinulosus	Pine-wood aster	C	E	Calhoun Bay
Bigelowia nuttallii	Nuttall's rayless goldenrod		E	Washington
Brickellia cordifolia	Flyr's brickell-bush		E	Leon Gadsden Jackson
Calopogon multiflorus	Many-flowered grasspink	C	E	Walton
Chrysopsis godfreyi	Godfrey's golden aster	C	E	Bay Walton
Chrysopsis gossypina ssp. *cruiseana*	Cruise's goldern aster	C	E	Bay Walton
Coeropsis integrifolia	Chipola dye-flower		E	Calhoun Jackson Washington
Conradina glabra	Apalachicola rosemary	E	E	Liberty
Crataegus phaenopyrum	Washington thorn		E	Wakulla Liberty Washington Walton
Croomia pauciflora	Croomia		E	Liberty Gadsden
Cuphea aspera	Tropical waxweed	C	E	Calhoun
Desmodium ochroleucum	Creamflower tick-trefoil		E	Jackson
Echinacea purpurea	eastern purple coneflower		E	Gadsden Jackson
Eriocaulon nigrobracteatum	Dark-headed hatpins		E	Calhoun Bay
Euphorbia telephioides	Telephus spurge	T	E	Bay
Forestiera godfreyi	Godfrey's privet		E	Liberty Gadsden Jackson
Fothergilla gardenii	Dwarf witch-alder		E	Walton
Harperocallis flava	Harper's beauty	E	E	Liberty
Hymenocallis henryae	Henry's spiderlily	C	E	Liberty Bay Walton
Hypericum lissophloeus	Smooth-barked St. John's wort	C	E	Bay Washington
Leitneria floridana	Corkwood		T	Wakulla
Liastris provincialis	Godfrey's blazing star	C	E	Wakulla
Lilium iridollae	Panhandle lily	C	E	Walton
Linum westii	West's flax	C	E	Calhoun Jackson
Lythrum curtissii	Curtiss's loosestrife		E	Liberty Gadsden
Macbridea alba	White birds-in-a-nest	T	E	Liberty Bay
Macranthera flammea	Hummingbird flower		E	Leon Liberty Gadsden Calhoun Jackson Bay Walton
Magnolia ashei	Ashe's magnolia	C	E	Wakulla Leon Liberty Gadsden Washington Walton
Marshallia obovata	Barbara's buttons		E	Washington
Matelea alabamensis	Alabama spiny-pod	C	E	Liberty Walton
Parnassia caroliniana	Carolina grass-of-parnassus	C	E	Liberty

Table 2
Plant Species Found in the Florida Counties Underlying IR-15 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Federal[1]	State[1]	Counties
Paronychia chartacea spp. *minima*	Crystal lake nailwort	T	E	Bay Washington
Pinguicula ionantha	Violet-flowered butterwort	T	E	Wakulla Liberty Bay
Pteroglossaspis ecristata	Giant orchid	C	T	Wakulla
Rhexia parviflora	Small-flowered meadow beauty	C	E	Liberty Calhoun Bay Walton
Rhexia salicifolia	panhandle meadow beauty	C	T	Leon Calhoun Bay Washington Walton
Rhododendron alabamense	Alabama rhododendron		E	Leon Gadsden
Rhododendron chapmanii	Chapman's rhododendron	E	E	Liberty Gadsden
Rudbeckia nitida	St. John's susan		E	Bay
Ruellia noctiflora	White-flowered wild petunia		E	Wakulla Liberty Jackson
Sarracenia rubra	Sweet pitcherplant	C	T	Bay Walton
Schwalbea americana	Chaffseed	E	E	Leon Gadsden
Scutellaria floridana	Florida skullcap	T	E	Liberty
Sideroxylon thornei	Thorne's buckthorn		E	Jackson
Silene polypetala	Fringed campion	E	E	Liberty Gadsden
Spigelia gentianoides	Gentian pinkroot	E	E	Calhoun Jackson Washington
Stachydeoma graveolens	Mock pennyroyal		E	Wakulla Leon Liberty Calhoun Bay
Taxus floridana	Florida yew	C	E	Liberty Gadsden
Thalictrum cooleyi	Cooley's meadowrue	E	E	Walton
Torreya taxifolia	Florida torreya	E	E	Liberty Gadsden Jackson
Trillium lancifolium	Narrow-leaved trillium		E	Liberty Gadsden Jackson
Uvularia floridana	Florida merrybells		E	Leon Gadsden Jackson
Xyris isoetifolia	Quillwort yellow-eyed grass		E	Bay Washington

Note: 1. E = Endangered
T = Threatened
C = Not listed but of special concern
Source: Florida Natural Areas Inventory, 1990.

Table 3
Animal Species Found in the Florida and Alabama Counties Underlying IR-30/31 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Taxon[1]	Federal[2]	State[2]	Counties[3]
Acipenser oxyrinchus desotoi	Gulf sturgeon	F	T		Baldwin Escambia Clarke Wilcox Monroe Covington
Alligator mississippiensis[4]	American alligator[4]	R	T	C	Walton Okaloosa
Ambystoma cingulatum	Flatwoods salamander	A	T	C	Walton Okaloosa Baldwin Covington
Athene cunicularia floridana	Florida burrowing owl	B		C	Okaloosa
Caretta caretta	Loggerhead turtle	R	T	T	Walton Okaloosa Baldwin
Charadrius alexandrinus	Snowy plover	B		T	Walton Okaloosa
Charadrius Melodus	Piping plover	B	T	T	Walton Okaloosa Baldwin
Chelonia mydas	Green turtle	R	E	E	Walton Okaloosa Baldwin
Dermochelys coriacea	Leatherback turtle	R	E	E	Walton Okaloosa
Drymarchon corais couperi	Eastern indigo snake	R	T	T	Walton Okaloosa Baldwin Escambia Conecuh Covington
Egretta caerulea	Little blue heron	B		C	Walton Okaloosa
Egretta rufescens	Reddish egret	B		C	Walton Okaloosa
Egretta thula	Snowy egret	B		C	Walton Okaloosa
Egretta tricolor	Tricolored heron	B		C	Walton Okaloosa
Etheostoma okaloosae	Okaloosa darter	F	E	E	Walton Okaloosa
Eudocimus albus	White ibis	B		C	Walton Okaloosa
Falco sparverius paulus	Southeastern American kestrel	B		T	Walton Okaloosa
Gopherus polyphemus	Gopher tortoise	R		C	Walton Okaloosa Baldwin Escambia Clarke Wilcox Monroe Butler Conecuh Covington
Haliaeetus leucocephalus	Bald eagle	B	T	T	Walton Okaloosa Baldwin Escambia Wilcox Conecuh Covington
Hyla andersonii	Pine barren treefrog	A		C	Walton Okaloosa
Lepidochelys kempii	Kemp's ridley turtle	R	E	E	Walton Okaloosa Baldwin
Macroclemys temminckii	Alligator snapping turtle	R		C	Walton Okaloosa
Medionidus penicillatus	Gulf moccasinshell	Mo	E		Walton
Mycteria americana	Wood stork	B	E	E	Baldwin Escambia Clarke Wilcox Monroe Conecuh Covington
Myotis grisescens	Gray bat	M	E	E	Monroe Conecuh
Notropis melanostomus	Blackmouth shiner	F		E	Walton Okaloosa
Pandion haliaetus	Osprey	B		C	Walton Okaloosa
Pelecanus occidentalis	Brown pelican	B		C	Walton Okaloosa
Peromyscus polionotus allophrys	Choctawhatchee beach mouse	M	E	E	Walton
Peromyscus polionotus ammobates	Alabama beach mouse	M	E		Baldwin
Phaeognatus hubrichti	Red hills salamander	A	T		Monroe Butler Conecuh Covington
Picoides Borealis	Red-cockaded woodpecker	B	E	T	Walton Okaloosa Baldwin Escambia Conecuh Covington
Pituophis melanoleucus mugitus	Florida pine snake	R		C	Walton Okaloosa
Pleurobema taitianum	Heavy pigtoe mussel	Mo	E		Baldwin Clarke Wilcox Monroe

Table 3
Animal Species Found in the Florida and Alabama Counties Underlying IR-30/31 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Taxon[1]	Federal[2]	State[2]	Counties[3]
Potamilus inflatus	Inflated heelsplitter mussel	Mo	T		Baldwin Clarke
Pseudemys alabamensis	Alabama red-bellied turtle	R	E		Baldwin Monroe
Pteronotropis welaka	Bluenose shiner	F		C	Walton Okaloosa
Rana capito	Gopher frog	A		C	Walton Okaloosa
Rana okaloosae	Florida bog frog	A		C	Okaloosa
Rynchops niger	Black skimmer	B		C	Walton Okaloosa
scaphirhynchus suttkusi	Alabama sturgeon	F	E		Baldwin Clarke Wilcox Monroe
Sterna antillarum	Least tern	B		T	Walton Okaloosa
Tamias striatus	Eastern chipmunk	M		C	Walton Okaloosa
Ursus americanus floridanus	Florida black bear	M		T	Walton Okaloosa

Notes:

1. A = Amphibian
   B = Bird
   C = Crustacean
   F = Fish
   M = Mammal
   Mo = Mollusk
   R = Reptile

2. E = Endangered
   T = Threatened
   C = Not listed but of special concern
   There are no state categories for Alabama

3. Walton and Okaloosa counties in Florida. All others in Alabama.

4. Listed because of its similarity with a threatened species from which it cannot be easily distinguished

Sources: Florida Natural Areas Inventory, 1990. Johnson and Wehrle, 2003.

Table 4
Plant and Lichen Species Found in the Florida and Alabama Counties Underlying IR-30/31 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Federal[1]	State[1]	Counties[2]
Asclepias viridula	Southern milkweed		T	Walton
Calopogon multiflorus	Many-flowered grasspink	C	E	Walton Okaloosa
Chrysopsis godfreyi	Godfrey's golden aster	C	E	Walton Okaloosa
Chrysopsis gossypina ssp. *cruiseana*	Cruise's goldern aster	C	E	Walton Okaloosa
Cladonia perforata	Perforate reindeer lichen	E	E	Okaloosa
Crataegus phaenopyrum	Washington thorn		E	Walton
Fothergilla gardenii	Dwarf witch-alder		E	Walton Okaloosa
Hymenocallis henryae	Henry's spiderlily	C	E	Walton
Lilium iridollae	Panhandle lily	C	E	Walton Okaloosa
Lindera subcoriacea	Bog spicebush	C	E	Okaloosa
Linum westii	West's flax	C	E	Okaloosa
Litsea aestivalis	Pondspice	C	E	Okaloosa
Macranthera flammea	Hummingbird flower		E	Walton Okaloosa
Magnolia ashei	Ashe's magnolia	C	E	Walton Okaloosa
Matelea alabamensis	Alabama spiny-pod	C	E	Walton
Rhexia parviflora	Small-flowered meadow beauty	C	E	Walton Okaloosa
Rhexia salicifolia	panhandle meadow beauty	C	T	Walton Okaloosa
Sarracenia rubra	Sweet pitcherplant	C	T	Walton Okaloosa
Schwalbea americana	Chaffseed	E	E	Baldwin
Thalictrum cooleyi	Cooley's meadowrue	E	E	Walton

Note:

1. E = Endangered
   T = Threatened
   C = Not listed but of special concern
   There are no state categories for Alabama

2. Walton and Okaloosa counties in Florida. Baldwin in Alabama.

Sources: Florida Natural Areas Inventory, 1990. Johnson and Wehrle, 2003.

Table 5
Animal Species Found in the Florida Counties Underlying IR-32/33 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Taxon[1]	Federal[2]	State[2]	Counties
Ajaia ajaia	Roseate spoonbill	B		C	Taylor Dixie Alachua Duval St. Johns
Alligator mississippiensis[3]	American alligator[3]	R	T	C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Ambystoma cingulatum	Flatwoods salamander	A	T	C	Alachua Columbia Union Bradford Duval
Ammodramus maritimus peninsulae	Scott's seaside sparrow	B		C	Taylor Dixie
Aphelocoma coerulescens	Florida scrub-jay	B	T	T	Putnam Clay Duval
Aramus guarauna	Limpkin	B		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Bradford Putnam Clay Duval St. Johns
Athene cunicularia floridana	Florida burrowing owl	B		C	Lafayette Gilchrist Dixie Alachua Suwannee
Caretta caretta	Loggerhead turtle	R	T	T	Taylor Dixie Duval St. Johns
Charadrius Melodus	Piping plover	B	T	T	Taylor Duval St. Johns
Chelonia mydas	Green turtle	R	E	E	Taylor Dixie Duval St. Johns
Cistothorus palustris griseus	Worthington's marsh wren	B		C	Duval
Cistothorus palustris marianae	Marian's marsh wren	B		C	Taylor Dixie
Dermochelys coriacea	Leatherback turtle	R	E	E	Taylor Dixie Duval St. Johns
Drymarchon corais couperi	Eastern indigo snake	R	T	T	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Egretta caerulea	Little blue heron	B		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Egretta rufescens	Reddish egret	B		C	Taylor Dixie Duval St. Johns
Egretta thula	Snowy egret	B		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Egretta tricolor	Tricolored heron	B		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Eretmochelys imbricata	Hawksbill turtle	R	E	E	Duval St. Johns
Etheostoma olmstedi	Tessellated darter	F		C	Putnam Clay Duval
Eudocimus albus	White ibis	B		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Falco sparverius paulus	Southeastern American kestrel	B		T	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval

Table 5
Animal Species Found in the Florida Counties Underlying IR-32/33 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Taxon[1]	Federal[2]	State[2]	Counties
Gopherus polyphemus	Gopher tortoise	R		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Grus canadensis pratensis	Florida sandhill crane	B		T	Lafayette Gilchrist Taylor Dixie Alachua Columbia Union Bradford Putnam Clay Duval
Haematopus palliatus	American oystercatcher	B		C	Duval St. Johns
Haliaeetus leucocephalus	Bald eagle	B	T	T	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Lepidochelys kempii	Kemp's ridley	R	E	E	Taylor Dixie Duval St. Johns
Macroclemys temminckii	Alligator snapping turtle	R		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford
Micropterus notius	Suwannee bass	F		C	Lafayette Gilchrist Dixie Alachua Columbia Suwannee Union Bradford
Mycteria americana	Wood stork	B	E	E	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Neoseps reynoldsi	Sand skink	R	T	T	Putnam Clay Duval
Palaemonetes cummingi	Squirrel chimney cave shrimp	C	T		Alachua
Pandion haliaetus	Osprey	B		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Pelecanus occidentalis	Brown pelican	B		C	Taylor Dixie Duval St. Johns
Peromyscus polionotus phasma	Anastasia beach mouse	M	E	E	St. Johns
Picoides Borealis	Red-cockaded woodpecker	B	E	T	Columbia Putnam Clay Duval
Pituophis melanoleucus mugitus	Florida pine snake	R		C	Lafayette Gilchrist Taylor Dixie Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Pleurobema pyriforme	Oval pigtoe	Mo	E		Lafayette Gilchrist Dixie Alachua Columbia Suwannee Union
Podomys floridanus	Florida mouse	M		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Procambarus erythrops	Santa Fe cave crayfish	C		C	Suwannee
Procambarus pictus	Black creek crayfish	C		C	Putnam Clay Duval
Pseudemys concinna suwanniensis	Suwannee cooter	R		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford

Table 5
Animal Species Found in the Florida Counties Underlying IR-32/33 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Taxon[1]	Federal[2]	State[2]	Counties
Rana capito	Gopher frog	A		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Rynchops niger	Black skimmer	B		C	Taylor Dixie Duval St. Johns
Sciurus niger shermani	Sherman's fox squirrel	M		C	Lafayette Gilchrist Taylor Dixie Alachua Columbia Suwannee Union Bradford Putnam Clay Duval St. Johns
Sterna antillarum	Least tern	B		T	Taylor Duval St. Johns
Stilosoma extenuatum	Short-tailed snake	R		T	Gilchrist Alachua Columbia Suwannee
Trichechus manatus	Manatee	M	E	E	Taylor Dixie Putnam Clay Duval St. Johns
Ursus americanus floridanus	Florida black bear	M		T	Taylor Alachua Columbia Union Putnam Clay Duval St. Johns

Notes:

1. A = Amphibian
   B = Bird
   C = Crustacean
   F = Fish
   M = Mammal
   Mo - Mollusk
   R = Reptile
2. E = Endangered
   T = Threatened
   C = Not listed but of special concern
3. Listed because of its similarity with a threatened species from which it cannot be easily distinguished.

Source: Florida Natural Areas Inventory, 1990.

Table 6
Plant Species Found in the Florida Counties Underlying IR-32/33 that are Federally- and/or State-Listed as being Endangered, Threatened, or of Special Concern.

Scientific Name	Common Name	Federal[1]	State[1]	Counties
Asclepias viridula	Southern milkweed		T	St. Johns
Balduina atropurpurea	Purple balduina	C	E	Putnam Clay Duval
Calopogon multiflorus	Many-flowered grasspink	C	E	Dixie Alachua Putnam Clay Duval St. Johns
Calydorea coelestina	Bartram's ixia		E	Bradford Putnam Clay Duval St. Johns
Conradina etonia	Etonia rosemary	E	E	Putnam Clay Duval
Corallorhiza odontorhiza	Autumn coralroot		E	Columbia
Ctenium floridanum	Florida toothache grass	C	E	Alachua Columbia Bradford Putnam Clay Duval St. Johns
Forestiera godfreyi	Godfrey's privet		E	Gilchrist Alachua Duval
Fothergilla gardenii	Dwarf witch-alder		E	St. Johns
Hartwrightia floridana	Hartwrightia		T	Putnam Clay Duval
Helianthus carnosus	Lake-side sunflower	C	E	Clay St. Johns
Leitneria floridana	Corkwood		T	Taylor Dixie
Linum westii	West's flax	C	E	Clay
Litsea aestivalis	Pondspice	C	E	Taylor Dixie Columbia Putnam Clay Duval
Monotropsis reynoldsiae	Pigmy pipes		E	St. Johns
Nemastylis floridana	Fall-flowering ixia	C	E	St. Johns
Pecluma ptilodon	Swamp plume polypoda fern		E	Putnam Clay Duval
Peperomia humilis	Terrestrial peperomia		E	Duval
Phyllanthus leibmannianus ssp. *platylepis*	Pinewood dainties	C	E	Taylor Dixie
Pteroglossaspis ecristata	Giant orchid	C	T	Lafayette Taylor Dixie Alachua Columbia Suwannee Bradford Putnam Clay Duval
Rhododendron chapmanii	Chapman's rhododendron	E	E	Clay
Rudbeckia nitida	St. John's susan		E	Clay St. Johns
Ruellia noctiflora	White-flowered wild petunia		E	Clay Duval St. Johns
Salix floridana	Florida willow	C	E	Columbia Suwannee Putnam Clay Duval
Schwalbea americana	Chaffseed	E	E	Putnam Clay Duval
Sideroxylon alachuense	Silver buckthorn		E	Alachua
Spiranthes polyantha	Green ladies' tresses	C	E	Duval
Thelypteris reptans	Creeping fern		E	Alachua Suwannee
Verbesina heterophylla	Variable-leaf crownbeard	C		Alachua Putnam Clay Duval St. Johns

Note: 1. E = Endangered
T = Threatened
C = Not listed but of special concern

Source: Florida Natural Areas Inventory, 1990.

APPENDIX C

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CALCULATION OF IMPACT PROBABILITY

For the purposes of explaining the calculations, only marine mammals will be used in this appendix; the same calculations were performed to assess impacts on sea turtles. The probability of TLAMs impacting marine mammals can be calculated by multiplying the marine mammal footprint density times the TLAM impact area density using the following equation:

$P_i = D_{mf} \times D_{ia}$, or

$P_i = (D_m \times F_m) \times (I \times A_i \times A_s^{-1})$, where:

P_i: probability of TLAMs impacting marine mammals.

D_{mf}: marine mammal footprint density in square nautical miles of marine mammal footprint per square nautical mile of ocean.

D_m: marine mammal density in individuals per square nautical mile.

F_m: marine mammal footprint in square nautical miles per individual of a size class.

D_{ia}: TLAM impact area density in square nautical miles of impact per square nautical mile of ocean.

I: expected number of TLAM ocean impacts.

A_i: TLAM impact area per impact event in square nautical miles.

A_s: study area size.

Assumptions:

- Equal distribution of animals throughout study area.
- Equal chance of jettisoned debris or failed missiles landing anywhere in the study area.
- All impact areas from jettisoned debris or failed missiles are equal.
- All TLAM missile launches could occur in one of the three marine areas.

The impact probability calculations use animal density estimates from three marine areas: Eastern Gulf of Mexico Operational Region, Key West Complex Region, and Jacksonville/Charleston Operations Area (US Navy, December 2002; US Navy, July 2003; US Navy October 2003). The density estimates were aggregated according to size categories for marine mammals: small, medium, and large (see Table C-1). Each of the four categories (including one for sea turtles) used a designated animal footprint estimated from typical animal areas of each category. (Note conversion factor: 1 sq nmi = 36,919,179 sq ft.)

Table C-1
Animal Density Categories

	Small marine mammals	Medium marine mammals	Large marine mammals	Sea turtles
Length	< 10 ft	10-33 ft	> 33 ft	N/A
Footprint	24 sq ft	68 sq ft	495 sq ft	32 sq ft

The number of expected ocean impacts was calculated on an annual basis. Both alternatives describe 12 missile launches per year. There are three jettisoned pieces per launch, and there is a missile failure rate of two percent. Therefore,

$$I = (12*3) + 12 \times 0.02 = 36.24$$

A_i was determined using the dimensions of the missile (see Table 2-1). The three jettisoned pieces would be much smaller than the entire missile, but the worst-case scenario is calculated here using the entire missile's size for all ocean impacts. Therefore,

$$A_i = \text{missile length x wing span} = 20.5 \text{ ft} \times 8.75 \text{ ft} = 180 \text{ sq ft}$$

TLAM launch operations, in either alternative, would occur in approximately one third of the area included in the Jacksonville/Charleston Operations Area; the remainder is outside of the study area. The study area size (A_s) for each region is:

- Eastern Gulf of Mexico Operational Region: 84,760 sq nmi
- Key West Complex Region: 93,418 sq nmi
- Jacksonville/Charleston Operations Area: 50,218 sq nmi (50,218/3 = 16,739 sq nmi)

Example:

As a hypothetical example for TLAM impacts:

To calculate D_{mf}:

D_m: 0.451 individuals per sq nmi

F_m: 0.00001 sq nmi per individual

$D_{mf} = D_m \times F_m$

= 0.00000451 sq nmi marine mammal footprint per sq nmi ocean

To calculate D_{ia}:

I: 5

A_i: 0.00002 sq nmi

A_s: 10,000 sq nmi

$D_{ia} = I \times A_i \times A_s^{-1}$
$= 0.00000001$ sq nmi impact per sq nmi ocean

To calculate P_i:

$P_i = Dmf \times Dia$

$= 4.51 \times 10^{-14}$

or, expressed as a ratio, $1:2.21729 \times 10^{13}$ (i.e., 1 in 22.2 trillion)

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APPENDIX D

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION

Introduction

This document provides the State of Florida with the U.S. Navy's Consistency Determination under CZMA Section 307 and 15 C.F.R. Part 930 Sub-part C. The information in this Consistency Determination is provided pursuant to 15 C.F.R. Section 930.39.

Pursuant to Section 307 of the Coastal Zone Management Act, 16 U.S.C. § 1456, as amended, and its implementing regulations at 15 C.F.R. Part 930, this is a Federal Consistency Determination for mission activities described within Chapter 2 of the *Environmental Assessment/Overseas Environmental Assessment for East Coast Testing of the Tomahawk Land Attack Missile*.

Proposed Federal agency action:

The Proposed Action, which is the preferred alternative in the EA/OEA, is the continued East Coast testing of the Tomahawk land attack missile. It differs from existing conditions only in that a new TLAM variant would be tested and that three additional target areas would be used.

The U.S. Navy has evaluated the missions described in the EA/OEA for potential effects on the land or water uses or natural resources of the State of Florida's coastal zone within the context of the statutes listed in the Florida Coastal Zone Management Plan (below).

Federal Consistency Review

Statutes addressed as part of the Florida Coastal Zone Management Program consistency review and considered in the analysis of the Proposed Action are discussed in the following table.

Florida Coastal Management Program Consistency Review

Statute	Consistency	Scope
Chapter 161 *Beach and Shore Preservation*	The proposed project would not adversely affect beach and shore management; there would be no coastal construction.	Authorizes the Bureau of Beaches and Coastal Systems within Florida Department of Environmental Protection to regulate construction on or seaward of the state's beaches.
Chapter 163, Part II *Growth Policy; County and Municipal Planning; Land Development Regulation*	The Proposed Action conforms to local government comprehensive development plans. Transitions from federal property into state property occur within existing instrument flight routes and would not interfere with development.	Requires local governments to prepare, adopt, and implement comprehensive plans that encourage the most appropriate use of land and natural resources in a manner consistent with the public interest.
Chapter 186 *State and Regional Planning*	State and regional agencies were provided the opportunity to review the EA. The Proposed Action would conform with the State Comprehensive Plan and associated translational plans	Details state-level planning requirements. Requires the development of special statewide plans governing water use, land development, and transportation.
Chapter 252 *Emergency Management*	The Proposed Action would not increase the state's vulnerability to natural disasters. Emergency response-and-evacuation procedures would not be impacted by the Proposed Action.	Provides for planning and implementation of the state's response to, efforts to recover from, and the mitigation of natural and manmade disasters.
Chapter 253 *State Lands*	The Proposed Action would not involve the use of state submerged lands.	Addresses the state's administration of public lands and property of this state and provides direction regarding the acquisition, disposal, and management of all state lands.
Chapter 258 *State Parks and Preserves* Chapter 259 *Land Acquisition for Conservation or Recreation* Chapter 260 *Recreational Trails*	The Proposed Action is consistent with policies to protect state conservation lands and water areas; state natural areas or environmentally unique and irreplaceable lands; state conservation lands; state historical or archeological sites; or lands that are currently part of the recreational trails system.	Addresses administration and management of state parks and preserves (Chapter 258). Authorizes acquisition of environmentally endangered lands and outdoor recreation lands (Chapter 259). Authorizes acquisition of land to create a recreational trails

Statute	Consistency	Scope
System Chapter 375 *Multipurpose Outdoor Recreation; Land Acquisition, Management, and Conservation*		system and to facilitate management of the system (Chapter 260). Develops comprehensive multipurpose outdoor recreation plan to document recreational supply and demand, describe current recreational opportunities, estimate need for additional recreational opportunities, and propose means to meet the identified needs (Chapter 375).
Chapter 267 *Historical Resources*	The Proposed Action most likely would not have a significant impact on cultural resources. Coordination with the State Historic Preservation Office is not required for this action.	Addresses management and preservation of the state's archaeological and historical resources.
Chapter 288 *Commercial Development and Capital Improvements*	The Proposed Action occurs primarily on federal property. The Proposed Action is not anticipated to have any effect on future business opportunities on state lands, or the promotion of tourism in the region.	Provides the framework for promoting and developing the general business, trade, and tourism components of the state economy.
Chapter 334 *Transportation Administration* Chapter 339 *Transportation Finance and Planning*	The state's transportation system would not be affected.	Addresses the state's policy concerning transportation administration (Chapter 334). Addresses the finance and planning needs of the state's transportation system (Chapter 339).
Chapter 370 *Saltwater Fisheries*	Saltwater fisheries would not be affected. All jettisoned material from TLAM flight tests would fall within the launch hazard pattern, well outside of the coastal zone.	Addresses management and protection of the state's saltwater fisheries.
Chapter 372 *Wildlife*	Potential impacts to wildlife, including threatened and endangered species, are evaluated in Chapter 4 of the EA. The Proposed Action would not significantly affect wildlife, including threatened and/or endangered species.	Addresses the management of the wildlife resources of the state.
Chapter 373	Potential impacts to water resources	Addresses the state's policy

Statute	Consistency	Scope
Water Resources	would not be significant. Water consumption would only be required for a limited number of personnel needed to support the Proposed Action.	concerning water resources.
Chapter 376 *Pollutant Discharge Prevention and Removal*	The Proposed Action would be consistent with policies designed to prevent, control, and abate pollutant discharges. There would be no significant impacts from pollutant discharges as range management standard operating procedures would be followed during termination of TLAM flight tests.	Regulates transfer, storage, and transportation of pollutants, and cleanup of pollutant discharges.
Chapter 377 *Energy Resources*	Energy resource production, including oil and gas, and the transportation of oil and gas would not be affected by the Proposed Action.	Addresses regulation, planning, and development of the state's energy resources.
Chapter 380 *Land and Water Management*	The Proposed Action would primarily occur on federally-owned lands. The Proposed Action would not involve land development and would be consistent with current land use.	Establishes land and water management policies to guide and coordinate local decisions relating to growth and development.
Chapter 381 *Public Health, General Provisions*	The Proposed Action does not involve the construction of an on-site sewage treatment and disposal system and would not adversely affect public health, groundwater, or surface waters.	Establishes public policy concerning the state's public health system.
Chapter 388 *Mosquito Control*	The Proposed Action would not affect mosquito control.	Addresses mosquito-control effort in the state.
Chapter 403 *Environmental Control*	The Proposed Action would not significantly affect ecological systems and water quality of state waters. The Proposed Action would not significantly affect air quality. (See Chapter 4 of the EA for detailed analyses.)	Establishes public policy concerning environmental control in the state.
Chapter 582 *Soil and Water Conservation*	The Proposed Action would not result in soil erosion and/or significant impacts to water quality from soil erosion. Soil and water conservation policies would continue to be followed.	Provides for the control and prevention of soil erosion.

Pursuant to 15 C.F.R. § 930.41, the Florida State Clearinghouse has 60 days from receipt of this document in which to concur with or object to this Consistency Determination, or to request an extension, in writing, under 15 C.F.R. § 930.41(b). Florida's concurrence will be presumed if the Navy does not receive its response on the 60th day from receipt of this determination.

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Department of Environmental Protection

Jeb Bush
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Colleen M. Castille
Secretary

August 13, 2004

Mr. Dan Nichols, Chief
Environmental Stewardship Division
Department of the Air Force
501 De Leon St, Ste 101
Eglin AFB, FL 32542-5133

RE: Department of the Navy and Department of the Air Force – Draft Environmental Assessment/Overseas Environmental Assessment for East Coast Testing of the Tomahawk Land Attack Missile, Atlantic Ocean and Gulf of Mexico – of Interest to the State of Florida.
SAI: FL200406307421C

Dear Mr. Nichols:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 95-359, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the above-referenced project.

The applicant is advised to minimize and avoid impacts to wetlands and other surface waters to the greatest extent practicable. The applicant is also advised to coordinate with the Florida Department of Transportation regarding air traffic control issues.

Based on the information contained in the above-referenced project and the comments provided by our reviewing agencies, the state has determined that the proposed project is consistent with the Florida Coastal Management Program (FCMP).

Thank you for the opportunity to review this project. If you have any questions regarding this letter, please contact Mr. Daniel Lawson at 850/245-2174.

Yours sincerely,

Sally B. Mann, Director
Office of Intergovernmental Programs

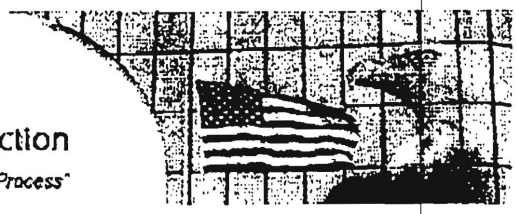
SBM/dl
Enclosures

cc: Mollie Palmer, FDEP
Mary Tanner, OPB
Charlotte Hand, FDOT

Categories

Florida
Department of Environmental Protection

"More Protection, Less Process"



Project Information	
Project:	FL200406307421C
Comments Due:	July 30, 2004
Letter Due:	August 29, 2004
Description:	DEPARTMENT OF THE NAVY AND DEPARTMENT OF THE AIR FORCE - DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT FOR EAST COAST TESTING OF THE TOMAHAWK LAND ATTACK MISSILE, ATLANTIC OCEAN AND GULF OF MEXICO - OF INTEREST TO THE STATE OF FLORIDA.
Keywords:	NAVY AND USAF - DRAFT EA EAST COAST TESTING OF THE TOMAHAWK LAND ATTACK MISSILE
CFDA #:	12.200
Agency Comments:	
COMMUNITY AFFAIRS - FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS	
Released Without Comment	
ENVIRONMENTAL PROTECTION - FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION	
The applicant is advised to minimize and avoid impacts to wetlands and other surface waters to the greatest extent practicable.	
FISH and WILDLIFE COMMISSION - FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION	
NO COMMENT BY BRIAN BARNETT ON 07/02/04	
STATE - FLORIDA DEPARTMENT OF STATE	
No comment/Consistent	
TRANSPORTATION - FLORIDA DEPARTMENT OF TRANSPORTATION	
NC	
NORTHWEST FLORIDA WMD - NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT	
No comment.	
ST. JOHNS RIVER WMD - ST. JOHNS RIVER WATER MANAGEMENT DISTRICT	
No comments.	
SUWANNEE RIVER WMD - SUWANNEE RIVER WATER MANAGEMENT DISTRICT	
No Final Comments Received	
ENVIRONMENTAL POLICY UNIT - OFFICE OF POLICY AND BUDGET, ENVIRONMENTAL POLICY UNIT	
No Final Comments Received	

For more information please contact the Clearinghouse Office at:

3900 COMMONWEALTH BOULEVARD MS-47
TALLAHASSEE, FLORIDA 32399-3000
TELEPHONE: (850) 245-2161
FAX: (850) 245-2190

Visit the Clearinghouse Home Page to query other projects.

COUNTY: ALL

DATE: 6/30/2004
COMMENTS DUE DATE: 7/30/2004
CLEARANCE DUE DATE: 8/29/2004
SAI#: FL200406307421C

MESSAGE:

STATE AGENCIES	WATER MNGMNT. DISTRICTS	OPB POLICY UNIT	RPCS & LOC GOVS
COMMUNITY AFFAIRS	X NORTHWEST FLORIDA WMD	ENVIRONMENTAL POLICY UNIT	
ENVIRONMENTAL PROTECTION	ST. JOHNS RIVER WMD		
FISH and WILDLIFE COMMISSION	SUWANNEE RIVER WMD		
STATE			
TRANSPORTATION			

The attached document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evaluation and is categorized as one of the following:

_ Federal Assistance to State or Local Government (15 CFR 930, Subpart F). Agencies are required to evaluate the consistency of the activity.

X Direct Federal Activity (15 CFR 930, Subpart C). Federal Agencies are required to furnish a consistency determination for the State's concurrence or objection.

_ Outer Continental Shelf Exploration, Development or Production Activities (15 CFR 930, Subpart E). Operators are required to provide a consistency certification for state concurrence/objection.

_ Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

Project Description:

DEPARTMENT OF THE NAVY AND DEPARTMENT OF THE AIR FORCE - DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT FOR EAST COAST TESTING OF THE TOMAHAWK LAND ATTACK MISSILE, ATLANTIC OCEAN AND GULF OF MEXICO - OF INTEREST TO THE STATE OF FLORIDA.

To: Florida State Clearinghouse

AGENCY CONTACT AND COORDINATOR (SCH)
3900 COMMONWEALTH BOULEVARD MS-47
TALLAHASSEE, FLORIDA 32399-3000
TELEPHONE: (850) 245-2161
FAX: (850) 245-2190

EO. 12372/NEPA

☑ No Comment
☐ Comment Attached
☐ Not Applicable

Federal Consistency

☐ No Comment/Consistent
☐ Consistent/Comments Attached
☐ Inconsistent/Comments Attached
☐ Not Applicable

NO COMMENTS

From:

Division/Bureau: NWFWMD Resource Management Div.
Reviewer: Duncan J. Cairns
Date: Date 19 JULY 2004

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_____
_____

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APPENDIX E

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CLEAN AIR ACT GENERAL CONFORMITY RULE
RECORD OF NON-APPLICABILITY
EAST COAST TESTING OF THE TOMAHAWK LAND ATTACK MISSILE

The Clean Air Act (CAA) as amended requires federal actions to conform to an approved state implementation plan (SIP) designed to achieve or maintain an attainment designation for air pollutants as defined by the National Ambient Air Quality Standard (NAAQS). The General Conformity Rule (40 CFR Parts 51 and 93) implements these requirements for actions occurring in air quality non-attainment or maintenance areas.

The Navy proposes to continue testing the Tomahawk land attack missile (TLAM) on the East Coast of the United States. The proposed action includes testing of a new TLAM variant, which would have hard-impact landings, and includes the use of Eglin Air Force Base (AFB) Test Areas B-75, C-52, and C-72 in addition to Test Area B-70, which is currently used by the TLAM Program. The proposed action would use the same instrument routes (IRs) that are currently used in the TLAM Program on the East Coast.

Most parts of the study area, including IRs, launch sites, and Test Areas, are in attainment for all criteria pollutants. However, IR 032/033 is above part of Duval County, Florida, which is designated as a maintenance area for ozone (O_3).

Provisions in the conformity rule allow for exemptions from performing a conformity determination altogether and from performing a full conformity determination if total emissions of individual pollutants due to the action fall below specific threshold values, or *de minimis,* levels. The values are based on the severity of non-attainment. For an O_3 maintenance area, such as Duval County area, *de minimis* criteria of 100 tons per year of NO_x or VOC apply.

This Record of Non-Applicability is for the continued East Coast testing of the TLAM. It is determined that no foreseeable new emissions of NO_x or VOC would result from the TLAM testing along IR 032/033 above part of Duval County, Florida. Therefore, a formal conformity analysis is not required.

To the best of my knowledge the information provided is correct and accurate. I concur with the finding that the proposed action will conform to the Florida's SIP.

_____ _____

Date

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APPENDIX F

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PUBLIC NOTIFICATION

In compliance with the National Environmental Policy Act, Eglin Air Force Base announces the availability of a draft Environmental Assessment and Finding of No Significant Impact for Tomahawk Land Attack Missle (TLAM) for public review and comment.

The Proposed Action of Tomahawk Land Attack Missle, consists of the testing of current variants and one new variant of the TLAM. Unlike the current variant that can result in soft, parachute landings, the new variant would always result in a hard landing as it is not equipped with a parachute. All Test missiles would continue to be equipped with inert warheads. TLAMs would continue to be launched from all of the launch areas currently used at approximately the same rate (between six and 12 TLAM flight tests per year). Targets at three additional test areas (Test Areas B-75, C-52, and C-72) at Eglin AFB would be used, as would special-use airspace established for use of these facilities.

Your comments on the draft TLAM EA are requested. Letters or other written or oral comments provided may be published in the Final EA. As required by law, comments will be addressed in the Final EA and made available to the public. Any personal information provided will be used only to identify your desire to make a statement during the public comment period or to fulfill requests for copies of the final EA or associated documents.

Private addresses will be compiled to develop a mailing list for those requesting copies of the final EA. However, only the names and respective comments of respondent individuals will be disclosed. Personal home addresses and phone numbers will not be published in the Final EA.

Copies of the TLAM Environmental Assessment and Finding of No Significant Impact may be reviewed at the Niceville Public Library, Destin Public Library, and Crestview Library. Copies will be available for review from Oct. 17, 2004 through Oct. 31, 2004.

Comments must be received by Nov. 3, 2004.

For more information or to comment on these proposed actions, contact: Mr. Mike Spaits, AAC/EM-PAV, 501 De Leon Street, Suite 101, Eglin AFB, Florica 32542-5133 or email, mike.spaits@eglin.af.mil. Tel: (850) 882-2878, Fax: (850) 882-6284.

562645

Northwest Florida Daily News
Notice

RCS 03-849
East Coast Testing of the Tomahawk Land Attack Missile

A public notice was published in the *Northwest Florida Daily News* on October 17, 2004 to disclose completion of the Draft EA, selection of the preferred alternative, and request comments during the 15-day pre-decisional comment period.

The 15-day comment period ended on October 31, 2004. Comments are required to be received by this office not later than November 3, 2004.

No comments were received during this period.

16 NOV 2004

Mike Spaits
96 ABW/EM-PAV, Public Information Specialist

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